NATIONAL METALLURGICAL LABORATORY

Silver Jubilee Souvenir

1950-1975

NATIONAL METALLURGICAL LABORATORY

JAMSHEDPUR • INDIA

Silver Jubilee Souvenir

"Success comes to those who dare and act;
it seldom goes to the timid"—Jawaharlal Nehru.

"A nation's strength ultimately consists in
what it can do on its own and not in what it can
borrow from others"—Indira Gandhi.

Late Shri Jawaharlal Nehru, Former Prime Minister and President of Council of Scientific and Industrial Research

Late Dr. S. S. Bhatnagar, Founder of Council of Scientific and Industrial Research and its first Director-General

Late Sir Jehangir Ghandy, Former Chairman, Planning Committee of NML and Chairman, NML Executive Council

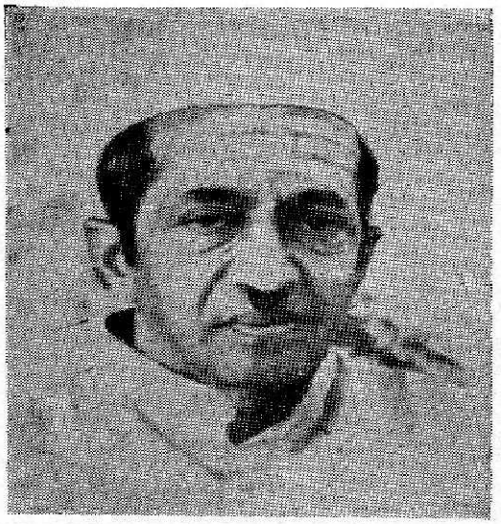
सत्यमेव जयते

राष्ट्रपति भवन नई दिल्ली - 110004
RASHTRAPATI BHAVAN NEW DELHI - 110004
INDIA

October 10, 1975

I am glad to know that the National Metallurgical Laboratory, Jamshedpur, will celebrate its Silver Jubilee shortly. On this happy occasion I send my felicitations to all those associated with this laboratory and wish it continued progress and prosperity in the years to come.

Fakhruddin Ali Ahmed



उपराष्ट्रपति, भारत
नई देहली
VICE-PRESIDENT
INDIA
NEW DELHI
July 16, 1975.

I am glad to know that the National Metallurgical Laboratory, Jamshedpur, will celebrate its Silver Jubilee in November, 1975. The Laboratory was established to foster applied and fundamental research and development work on Metallurgical and allied subjects on an organised basis. It is gratifying to note the progress it has made during the twenty five years of its existence. I wish the Laboratory continued success in its endeavours to serve the mineral and metal based industries in the country. I send my best wishes for the success of the Silver Jubilee Celebrations.

(B.D. Jatti)

प्रधान मन्त्री भारत
PRIME MINISTER,
INDIA.

MESSAGE

Ancient India's metallurgical skills were world renowned. But feudalism and foreign rule prevented us from taking advantage of the Industrial Revolution and the discoveries of modern science. Only in the last three decades could we shape our own destiny. Our programme of economic regeneration assigns a crucial role to the development of our mineral resources. Through its fundamental and applied research, the National Metallurgical Laboratory has made a significant contribution to the building up of key industries and to the attainment of technological self-reliance.

I am glad to know that the Laboratory is completing twenty-five years this November. My good wishes for its further success.

Indira Gandhi

(Indira Gandhi)

New Delhi,
July 15, 1975.

RAJ BHAVAN
PATNA
September 17, 1975.

MESSAGE

It is heartening to know that the National Metallurgical Laboratory, Jamshedpur, will be completing its 25 years of existence on the 14th November, this year. This Laboratory has made commendable progress in various fields of metallurgical science and technology. For economic progress of a country, scientific and technological developments are essential. This National Laboratory, which had the privilege of being formally inaugurated by the Prime Minister of India Late Pandit Jawaharlal Nehru, is successfully steering under the able guidance of its present Director.

This National Laboratory fully deserves to celebrate its Silver Jubilee, and I convey my best wishes for its grand success.

PATNA,

The ..... 1975.

MESSAGE.

It gives me pleasure to send my greetings to the National Metallurgical Laboratory, Jamshedpur on the occasion of its Silver Jubilee Celebrations. This laboratory has made significant constributions towards the growth of metallurgical industry in the country by fostering research and offering solutions to many technological problems. I hope, this laboratory will grow from strength to strength in the days to come and serve metallurgical research in still more effective way.

Jagannath Mishra

(Jagannath Mishra)
Chief Minister, Bihar.

2.8.75

सत्यमेव जयते

उपाध्यक्ष
योजनां आयोग
नई दिल्ली
DEPUTY CHAIRMAN
Planning Commission
New Delhi

July 25, 1975.

MESSAGE

I am glad to learn that the National Metallurgical Laboratory will be celebrating its Silver Jubilee in November this year. It is significant that this year the industries are seeking to utilise the sponge iron technology developed by this laboratory. With increasing demands for development and modification of technology to suit Indian conditions, I am sure the National Metallurgical Laboratory will be increasingly called upon by industries to come to their assistance. My greetings and best wishes go to the Director and his band of scientists on the occasion of the Silver Jubilee.

P. N. Haksar

(P. N. Haksar)

Message

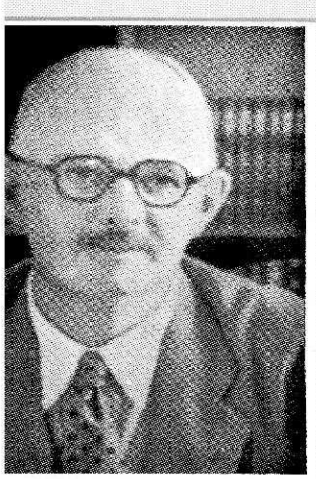
India is rich in mineral and metal resources, both in variety and avilability. The National Metallurgical Laboratory, Jamshedpur, founded 25 years ago to generate appropriate technology and aid the industrial and economic growth, has earned for itself the affection and trust from the industry, through its technical competence and contributions in metallurgical and allied subjects.

Among its several significant achievements are the beneficiation of low grade ores and minerals, production of ferro-alloys, aluminium alloys, utilisation of metallurgical wastes and more recently the development of technology for the production of sponge-iron.

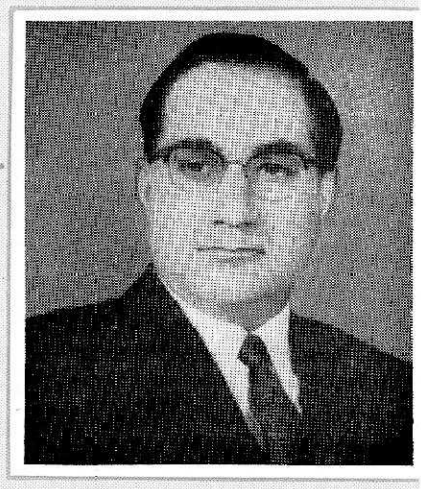
NML has come of age, making its impact felt, on the economic and industrial growth, serving the industry and the country at its best. On the occasion of the Silver Jubilee of the NML, CSIR family joins me to offer our very warm felicitations to the Director, scientists and other colleagues and wish them continued successes in their endeavour.

(Y.Nayudamma)
DIRECTOR-GENERAL
C S I R

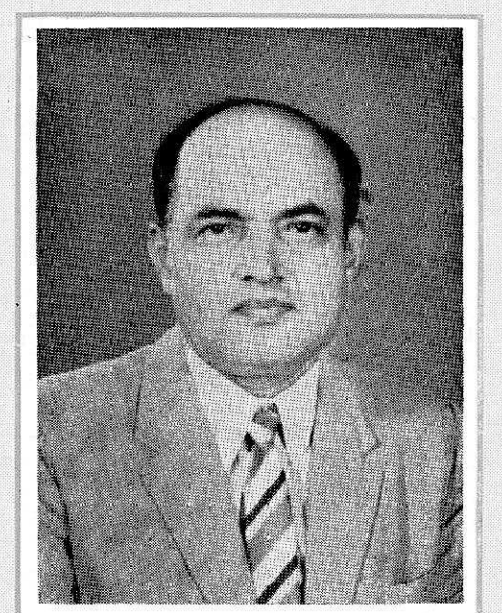
Directors & Scientists-in-Charge of The National Metallurgical Laboratory



Mr. E. H. Bucknall
Director (1953-1956)

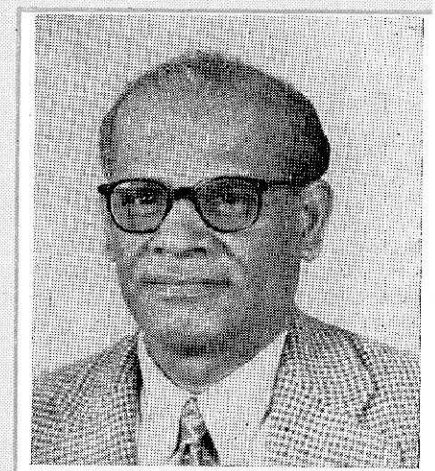


Dr. B. R. Nijhawan
Director (1956-1966)



Prof. V. A. Altekar
Director (Since August 1969)

Dr. T. Banerjee
Scientist-in-Charge
(1966-Feb. 1969)



Shri P. I. A. Narayanan
Scientist-in-Charge
(Feb. 1969-Aug. 1969)

Directors previous to 1953

Late Dr. G. Sachs (1949-1950)

Prof. Charles Crussard (1950-51)

Late Dr. G. P. Contractor
Acting Director (1951-53)

Twentyfive Years of National Metallurgical Laboratory

The National Metallurgical Laboratory was inaugurated on 26th November, 1950 by late Pandit Jawaharlal Nehru with the objective of fostering applied and fundamental metallurgical research on an organized basis and to serve as a central station for carrying out research and development work on indigenous ores, minerals, refractories, ferrous and non-ferrous metals and alloys etc. in relation to their potential applications in Indian mineral and metal industries.

With the advent of Five Year Plans shortly after independence, stress was laid on the establishment of basic industries and utilization of indigenous raw materials. In this context, the laboratory's research and development programme was reoriented to suit the requirements of dynamic growth and expansion of Indian mineral and metal industries under the impact of successive Five Year Plans. The discoveries of new deposits of virgin raw materials and the dearth of foreign exchange added additional responsibility on the laboratory to find out ways and means of the utilization of available resources to the fullest extent as well as development of substitute products to minimize and eliminate as far as practicable the imported metals, alloys and minerals.

There was thus need for expansion of the laboratory to cope up with increased quantum of work in multifarious fields of metallurgical science and technology. The laboratory was, therefore, progressively equipped on modern lines to undertake planned research and development projects in the context of country's industrialization programmes.

It became imperative in pursuing various applied projects to study on pilot plant scale trials, potential practical themes so as to determine their suitabilities for commercial exploitation under Indian raw materials conditions. This resulted in progressive establishment of various pilot plants. With the changing pattern of industrialization, installation of more number of pilot and semi-commercial plants are being actively pursued. Many of these pilot plants and precision equipments are entirely designed and fabricated by the laboratory.

The research and development work of the National Metallurgical Laboratory, during the last decade, have been geared up to generate a continuous dialogue between the researchers, planners, users and industries for identification and solution of problems pertaining to various disciplines of metallurgy against the background of industrial and national needs. This has resulted in winning the confidence of the industries and forging close links with them. The metal and mineral industries both in public and private sectors are showing keen interest in the processes and products developed by the Laboratory and are referring their problems and sponsoring projects in ever increasing number.

The National Metallurgical Laboratory has developed expertise in many disciplines which is utilized by industrial and other organizations both at national and international levels. Such consultancy work relates to preparation of feasibility and investigational project reports, setting up and commissioning of plants, solution of plant operation problems etc. Thus, based on extensive pilot plant investigations, consultancy and assistance provided the following plants have either been installed or under installation.

1. Iron Ore Beneficiation and Sintering Plants of M/s. Hindustan Steel Limited.
2. Iron Ore Beneficiation & Sintering Plant of M/s. Tata Iron & Steel Co. Ltd.
3. Iron Ore Beneficiation & Pelletization Plant of National Mineral Development Corporation.
4. Iron Ore Pelletization Plant of M/s. Chowgule & Co., Goa.
5. A Central Pelletization Plant in Collaboration with MECON.
6. Fluorspar Beneficiation Plant of Gujarat Mineral Development Corporation.
7. Beneficiation Plant for Rakha Copper Ore for M/s. Hindustan Copper Limited.
8. Benificiation Plant Malanjkhand Copper Project for M/s Hindustan Copper Ltd.

9. Sponge Iron Plant for M/s. Andhra Cement Company Limited.
10. Beneficiation Plant for Low-grade Pyrite and Phosphate for M/s. Pyrites, Phosphates and Chemicals Limited.
11. Graphite Beneficiation Plant for M/s. Patna State Graphite Mining Co., Titilagarh.
12. Graphite Crucible Production Plant for M/s. Patna State Graphite Mining, Titilagarh.
13. Graphite Beneficiation Plant and Graphite Crucible Production Plant for Andhra Pradesh Industrial Development Corporation.
14. Vanaduim Extraction Project of M/s. Mysore Iron & Steel Co. Ltd.

The Laboratory's contribution during the pas t two and half decades is by no means small. India's first commercial sponge iron plant has been commissioned and started production based on the technology of solid reduction process as developed in the Laboratory. The plant has been set up by M/s. Andhra Cement Company, Vijaywada, with the assistance and technical collaboration of the Laboratory. Production of sponge iron apart from mitigating the shortage of steel scrap will greatly facilitate in increasing the steel production through mini steel plants in the country.

The development of electric grade aluminium alloy (NML—PM2) has made a considerable impact in substituting the imported copper for production of electrical conductors, cables, winding wires etc. The product developed in the Laboratory is under commercial production by M/s. Aluminium Cable and Conductor (UP) Ltd., Calcutta, M/s. Bharati Smelting & Refining Corporation, Bombay and M/s. Galada Continuous Casting Ltd., Hyderabad. An indigenous electrical resistance alloy suitable for manufacture of heating elements has been developed and is now under commercial production by M/s. Cable Works (India) Ltd., Faridabad. Another firm M/s. Burjwal Electricals, U. P. is installing a plant for its production. The alloy developed can replace the conventional imported heating element like 'Nichrome', 'Kanthal', etc. containing nickel and coablt which are at present not produced in the country.

For the manufacture of alloy, tool and special steels, special types of ferro-alloys are needed which are to be imported. NML has developed know-how for the production of some special types of ferro-alloys which are now commercially produced by a number of firms which have resulted in reducing and eliminating their imports.

For the first time in the country, vanadium has been extracted on an industrial scale at Mysore Iron & Steel Works, utilizing the Laboratory developed technology, from vanadiferous iron ores available near Bhadravati, where the steel plant is situated. This technology also yields high grade pig iron as a bye-product.

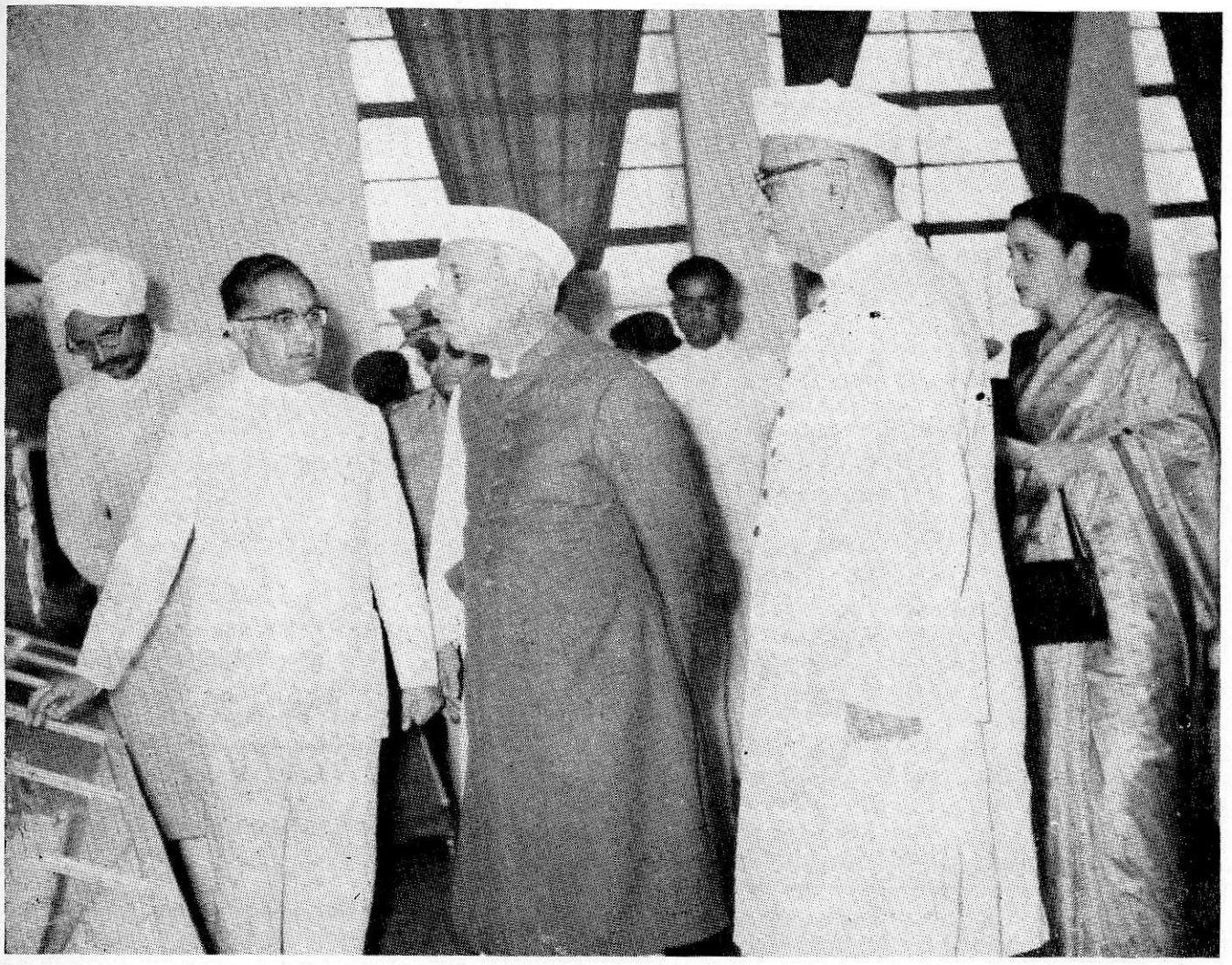
Medium phosphoric Indian pig iron requires to be treated by basic open hearth process for conversion into proper grade steel which needs heavy capital investment. NML has developed technique for its conversion directly into steel by side-blown basic converter process which can be installed and utilized by medium and small steel foundries to meet their needs for steel casting. The 'know how' developed has been licensed for commercial production.

In the manufacture of lower denomination coins like 1, 2, 3, 5 and 10 paisa coins, the aluminium—magnesium alloy developed by the Laboratory in collaboration with Govt. of India, Mint, is utilized. This has replaced the use of copper and nickel which are to be imported for the purpose. Due to the scarcity of zinc the Laboratory's technique of producing aluminized steel products in place of galvanized materials is commercially implemented by a number of firms. The processes of manufacturing electrolytic manganese metal from low grade ores, preparation of synthetic cryolite etc. are now under commercial implementation.

In the field of corrosion of metals and alloys, the Laboratory has developed an aluminium based alloy which can be used in place of the conventional imported alloy for protection of the hull of the sea going vessel. Besides, a large number of industrial corrosion problems have been investigated and suitable remedial measures suggested which have resulted in minimizing the plant corrosion problems.

Standard reference materials are imported for the purpose of accurate chemical analysis. The Laboratory has developed technique and now producing different types of standard materials for chemical and spectrographic analysis which are supplied to research and industrial organizations to meet their need.

To assist the foundries, the Laboratory has investigated a large number of foundry moulding sands and bonding clays and have determined their suitabilities for different casting purposes. This has helped the foundry industries in selecting the proper types of foundry raw materials and also setting up sand processing units. A large number of industrial foundry problems have been success-



Visit of Pandit Jawaharlal Nehru Former Prime Minister and Dr. Zakir Hussain, Former President of India at National Metallurgical Laboratory in 1958

fully solved and foundries concerned have been furnished with findings followed by practical demonstration of the operations involved. An equi-blast-cum-balanced blast cupola developed by the Laboratory has been set up in a number of foundries in Punjab and Haryana Region. A type of self-setting sand and wear and abrasion resistant cast iron have also been developed.

An important item in metal production is the refractory materials which are used in lining of the furnace for the protection of the metal structure. Many types of refractories such as fosterite refractories, sillimanite refractories, kyanite refractories, carbon refractories, magnesite refractories, chrome-magnesite refractories etc. have been developed from raw materials hitherto unexploited. A dense carbon aggregate suitable for making soderberg paste for the manufacture of electrodes in electric furnace has been developed which otherwise has to be imported. Carbon and clay bonded graphite crucibles suitable for melting of non-ferrous metals were used to be imported. Based on the technique developed in the Laboratory these products are now manufactured in the country mostly from indigenous raw materials. A type of welding flux suitable for submerged arc welding, which used to be imported, is now commercially produced utilizing the NML process.

Causes of service failures of metals and alloys in commercial plants and equipments have been extensively investigated in the Laboratory and suggestion to overcome such failures have been furnished to concerned industries. Utilization of metallurgical waste products has been focussed by the National Metallurgical Laboratory to meet many of the essential needs of the country. The 'know-how' of recovery of

zinc from galvanizers' dross has been licensed to industry. A process for the recovery of tin from tinplate scrap has been worked out which can lead to the conservation and utilization of this valued imported metal. Know-how for the preparation of various types of metallic powder have been developed and licensed for commercial production.

Many of the precision equipments, apparatus and pilot plants have been fully designed and fabricated in the Laboratory which has saved considerable amount of foreign exchange as well as economised the expenditure of the Laboratory.

For the development of steels for high temperature service as required in aircraft, boilers, pressure vessels, turbine etc. the Laboratory with the assistance of UNDP has set up a Creep Testing Laboratory with 150 Test points with provision to expand to 400 Test Points.

The furture development programme of the Laboratory comprises of augmentation of mineral beneficiation and extraction metallurgical facilities and a National Corrosion Research Centre with the assistance of UNDP. Adequate Metal working facility has also been planned.

Due to unfortunate force of circumstances the Laboratory has suffered due to lack of space. Its activities and residential colonies had to be dispersed over widely saparated small patches of land obtained from time to time. In view of this, a decision was taken to obtain one single piece of 10 acres at Adityapur, about 10 Kilometres from Jamshedpur for the development and expansion programme of augmentation of mineral benefication and hydro-and electro-metallurgical extraction facilities.

A major activity of the Laboratory relates to the free technical advice given to the industries for solution of thier problems, which do not involve any investigational work. A large number of industries, particularly the small scale industries, have been benefitted by this service.

The Laboratory is holding periodic 'Get-togethers' in respective State Capitals, to appraise the industries the products and processes developed by the Laboratory and the assistance that can be rendered for the commercial exploitation of these materials as well as to study and investigate their problems for the betterment of their products. Entrepreneurs, industrialists business people as also Govt. Officers join in these get togethers.

For the dissemination and exchange of technical information and ideas, the Laboratory holds symposia and seminars on topical metallurgical and allied subjects. Twenty such symposia and seminars have been held so far and most of the proceedings containing technical papers and discussions have been published. Besides, the Laboratory brings out its own journal, 'NML Technical Journal' which has been well received in the world of technical journalism. Monographs relating to results of investigations conducted on specific subjects are brought out from time to time. A monthly publication on 'Documented Survey on Metallurgical Development' containing classified abstracts of papers pertaining to metallurgical and allied field published in various scientific and technical journals of the world is also brought out. A House bulletin entitled 'NML News Letter' is published monthly for internal circulation.

The National Metallurgical Laboratory during its twentyfive years of existence has contributed towards setting up of several commercial plants through consultancy and investigation and production of a number of products based on indigenous raw materials which have saved a few crores of rupees in terms of foreign exchange.

The scope of research and development work at National Metallurgical Laboratory is as vast as it is challenging; this challenge is being effectively met by a band of dedicated scientists and staff which has resulted in its obtaining recognition both from overseas and at home as one of the leading metallurgical centres of research.

Staff Members Who have Completed 25 Years of Service and Still Continuing

	Name	Present Designation	Date of Appointment
1.	Shri G. C. Mishra	Mechanic	2.12.1946
2.	,, P. R. Mahanty	Mistry	7. 1.1948
3.	,, D. S. Tandon	Scientist 'C'	9. 4.1948
4.	,, Sewa Singh	Scientist 'C1'	30. 8.1948
5.	,, Md. Yakub	Foreman	6. 9.1948
6.	,, Gian Singh	Assistant	8. 9.1948
7.	,, Amlok Singh	Foreman	20. 9.1948
8.	,, Motilal	Mistry	23.10.1948
9.	,, B. B. Mishra	Mechanic	5.11.1948
10.	,, Shambhu Singh	Mistry	27.11.1948
11.	,, A. K. Choudhury	Foreman	1.12.1948
12.	,, K. S. Krishnan	Sr. Stenographer	17.12.1948
13.	,, J. K. Chakraborty	S. T. A.	21.12.1948
14.	,, Sudhangsu Kr. Bose	S. T. A.	27.12.1948
15.	,, H. K. Chakraborty	Scientist 'E'	15. 1.1949
16.	,, K. N. Mukherjee	Safety Inspector	21. 1.1949
17.	,, Harbhajan Singh	Foreman	25. 1.1949
18.	,, G. B. Paul	Foreman	1. 3.1949
19.	,, B. N. Pani	Sr. Gestetner Operator	4. 4.1949
20.	,, K. N. Srivastava	Scientist 'E'	16. 5.1949
21.	,, A. M. Nair	Sr. Stenographer	21. 5.1949
22.	,, N. G. Banerjee	Scientist 'E'	24. 5.1949

Sl. No.	Name	Present Designation	Date of Appointment
23.	Shri G. P. Mathur	Scientist 'F'	8. 6.1949
24.	Dr. S. S. Bhatnagar	Scientist 'E'	23. 7.1949
25.	Shri A. N. Kapoor	Scientist 'E'	22. 9.1949
25.	Shri Mukhtari Lal	Mistry (NML F. S. Batala)	29.10.1949
27.	Dr. N. Dhananjayan	Scientist 'C'	1.11.1949
28.	Shri K. D. Pillai	Foreman	14.11.1949
29.	,, V. S. Sampath	Scientist 'C'	1. 3.1950
30.	,, Kartar Singh	Technician	29. 3.1950
31.	,, Mohinder Singh	Mechanic	3. 5.1950
32.	,, C. K. Das	Scientist 'B1'	13. 5.1950
33.	,, G. D. Sani	Scientist 'B'	15. 5.1950
34.	,, Santosh Kr. Banerjee	Scientist 'E'	24. 6.1950
35.	,, T. Adeyya	Sr. Stenographer	19. 7.1950
36.	,, Dasrath Pathak	Mechanic	1. 9.1950
37.	,, Ramadhar	Garden Choudhury	1. 9.1950
38.	,, Srinivas Naik	Garden Choudhury	1. 9.1950
39.	,, P. C. Bose	Foreman	17.10.1950
40.	Dr. Ved Prakash	Scientist 'E'	21.10.1950
41.	Shri N. N. Lahiri	Fine Mechanic	15.11.1950
42.	,, R. Rama Rao	Foreman	24.11.1950
43.	,, H. A. Deb	Mechanic	24.11.1950

Awards Received by Staff Members (Past and Present)

Awards	Recipient
Padma Shri by President of India	Dr. B. R. Nijhawan
Shanti Swroop Bhatnagar Memorial Award by CSIR	Dr. B. R. Nijhawan
National Metallurgists' Award by Ministry of Steel & Mines Government of India	1. Prof. V. A. Altekar 2. Shri P. P. Bhatnagar 3. Dr. R. Kumar 4. Dr. S. S. Bhatnagar 5. Dr. M. R. K. Rao 6. Dr. A. K. Lahiri 7. Shri K. N. Gupta
National Mineral Award by Deptt. of Mines, Ministry of Steel & Mines, Government of India	Shri G. P. Mathur
Kamani Gold Medal by Indian Institute of Metals	1. Prof. V. A. Altekar 2. Dr. M. N. Parthasarathy 3. Shri S. M. Arora 4. Shri R. N. Mishra
Binani Gold Medal by Indian Institute of Metals	1. Dr. R. Kumar 2. Dr. Manjit Singh 3. Dr. N. Dhananjayan 4. Shri P. P. Bhatnagar
Japan Iron & Steel Institute Gold Medal	Dr. B. R. Nijhawan
Indian Institute of Foundrymen Gold Medal	Shri R. M. Krishnan
Silver Plaque Award by Indian Institute of Foundrymen	Dr. B. R. Nijhawan
Invention Promotion Board Award	1. Prof. V. A. Alteker 2. Shri P. P. Bhatnagar 3. Shri V. S. Sampath 4. Shri G. Bysak 5. Dr. Ved Prakash 6. Shri S. K. Roy
Dr. K. G. Naik Gold Medal by University of Baroda	Dr. T. Banerjee
Sir Padamji Ginwala Gold Medal by Indian Institute of Metals	Shri S. P. Chakroborty
Capt. N. N. Dutt Medal by Council of Chemists, India	Shri A. Ghosh
Distinghuished Alumnus Award of Banaras Hindu University, Department of Metallurgical Engineering	1. Shri P. I. A. Narayanan 2. Dr. B. R. Nijhawan 3. Prof. V. A. Altekar 4. Shri R. M. Krishnan 5. Dr. R. Kumar

Staff Members (Past and Present) Who Received Doctorate Degrees, Submitted Thesis and Registered for Submission of Thesis on The Basis of the Work at NML

A. Received Doctorate Degree

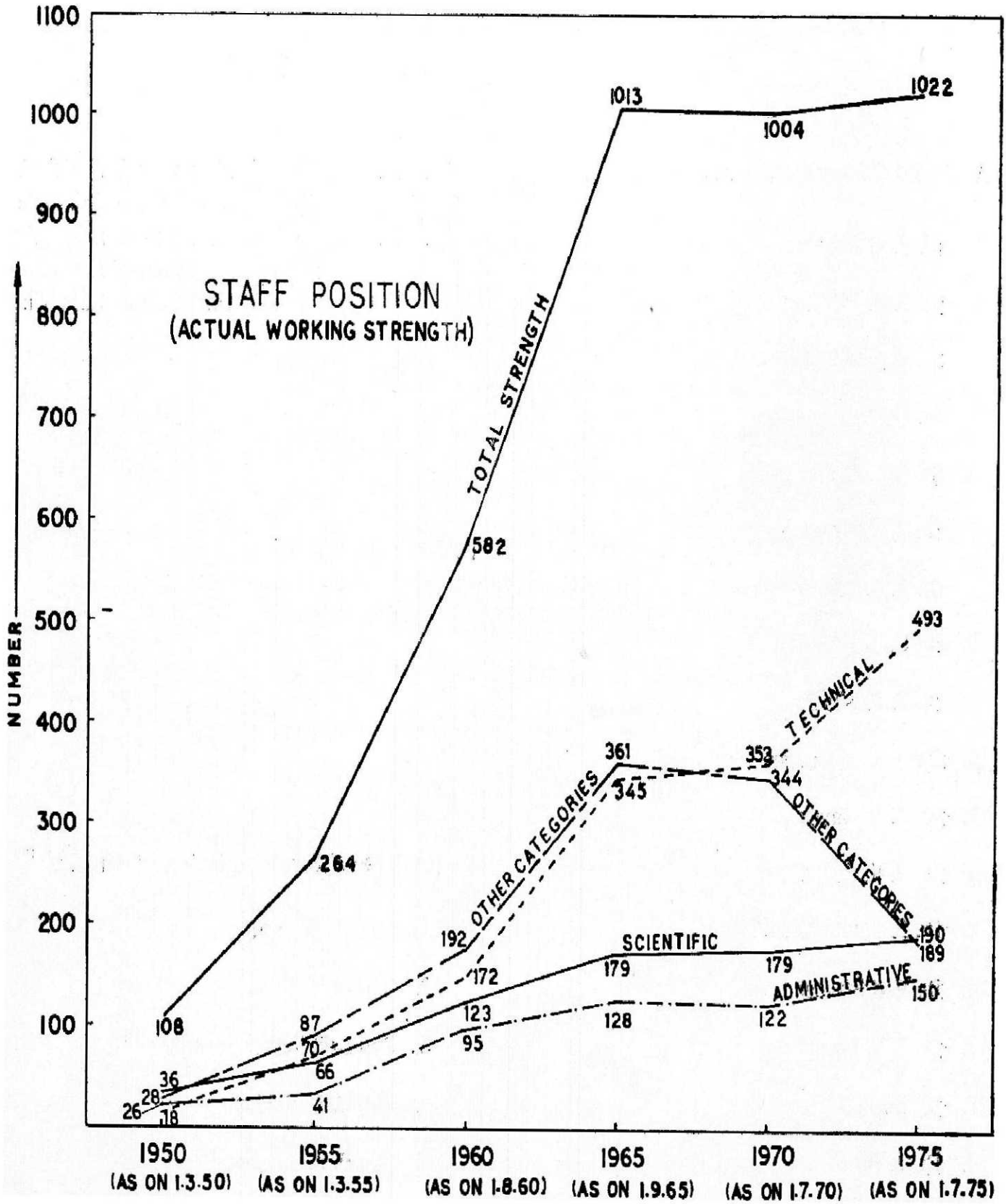
1. Dr. P. L. Ahujha
2. Dr. S. S. Bhatnagar
3. Dr. U. Chatterjee
4. Dr. N. Dhananjayan
5. Dr. R. K. Dubey
6. Dr. R. V. Hargave
7. Dr. A. K. Lahiri
8. Dr. G. Mishra
9. Dr. S. P. Mishra
10. Dr. J. K. Mukherjee
11. Dr. A. K. Nayak
12. Dr. P. K. Panda
13. Dr. P. Prabhakaram
14. Dr. Ved Prakash
15. Dr. T. V. Prasad
16. Dr. M. R. K. Rao
17. Dr. S. Roy
18. Dr. Inder Singh
19. Dr. Manjit Singh
20. Dr. Khalaf } Scientists from United Arab Republic under the Scientific and Technical Co-operation Agreement between Govts of India and United Arab Republic
21. Dr. Shariff }
22. Dr. B. P. Varma

B. Submitted Thesis

1. Shri R. Halder

C. Registered for Submission of Thesis

1. Mrs. A. Bahadur
2. Shri M. K. Banerjee
3. Shri Salil Kumer Banerjee
4. Shri U. C. Bhakta
5. Shri B. K. Saxena
6. Shri Narinder Singh
7. Shri A. V. Subhramaniam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(ACTUAL WORKING STRENGTH)
NUMBER
1100
1000
900
800
700
600
500
400
300
200
100
TOTAL STRENGTH
1013
1022
1004
582
264
108
TECHNICAL
493
353
OTHER CATEGORIES
361
345
344
192
OTHER CATEGORIES
190
189
SCIENTIFIC
179
179
172
ADMINISTRATIVE
150
123
128
122
95
87
70
66
41
36
28
26
18
1950
(AS ON 1.3.50)
1955
(AS ON 1.3.55)
1960
(AS ON 1.8.60)
1965
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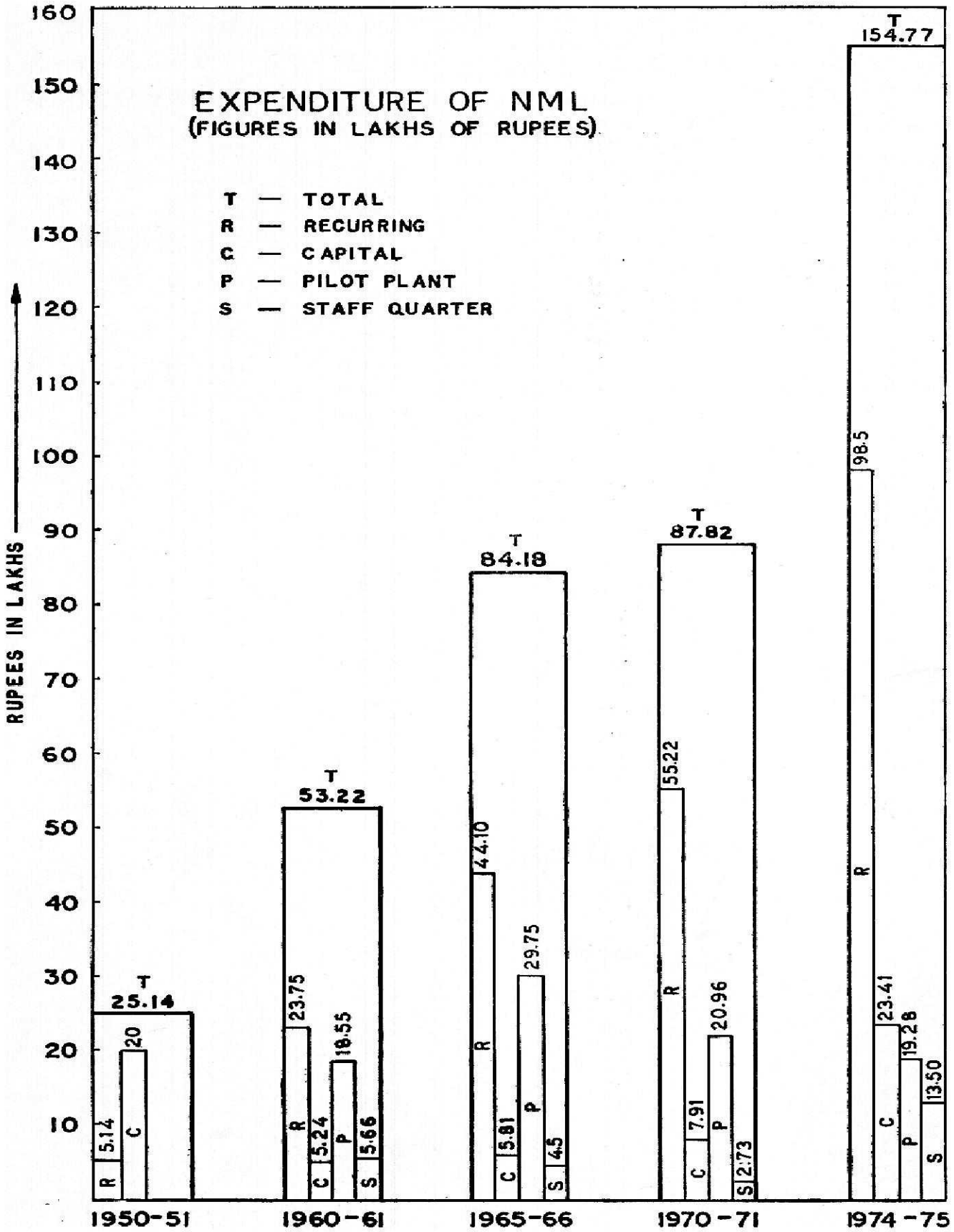
1970
(AS ON 1.7.70)
1975
(AS ON 1.7.75)

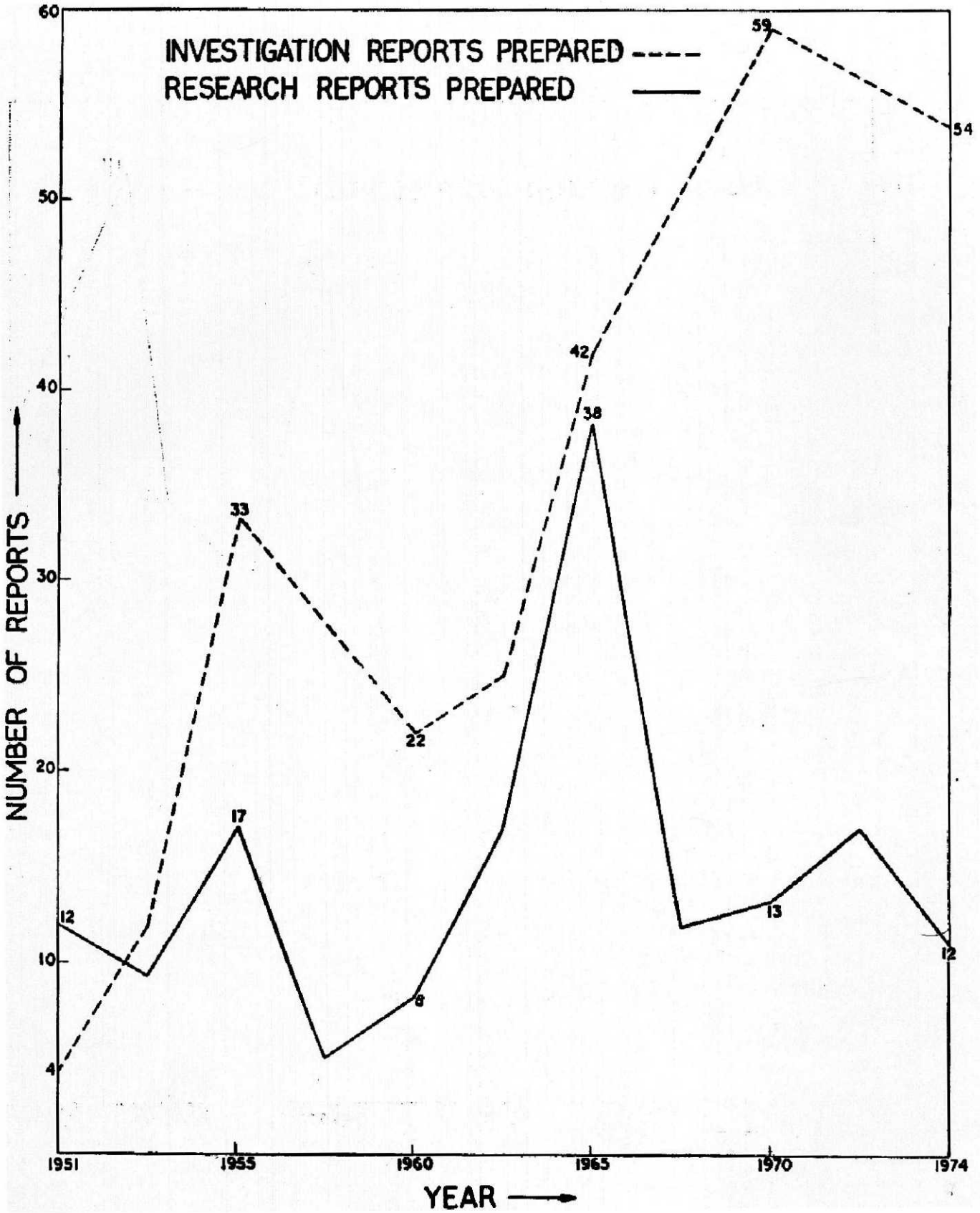

EXPENDITURE OF NML
(FIGURES IN LAKHS OF RUPEES)
T — TOTAL
R — RECURRING
C — CAPITAL
P — PILOT PLANT
S — STAFF QUARTER
RUPEES IN LAKHS
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
1950-51
T 25.14
R 5.14
C 20
1960-61
T 53.22
R 23.75
C 5.24
P 18.55
S 5.66
1965-66
T 84.18
R 44.10
C 5.81
P 29.75
S 4.5
1970-71
T 87.82
R 55.22
C 7.91
P 20.96
S 2.73
1974-75
T 154.77
R 98.5
C 23.41
P 19.28
S 13.50

Research and Investigation Reports Prepared

Research Reports		Investigation Reports	
Year	Number	Year	Number
1951	12	1951	4
1952	6	1952	10
1953	9	1953	14
1954	13	1954	20
1955	17	1955	33
1956	25	1956	22
1957	10	1957	12
1958	5	1958	29
1959	8	1959	31
1960	8	1960	22
1961	10	1961	32
1962	9	1962	30
1963	17	1963	25
1964	32	1964	50
1965	38	1965	42
1966	17	1966	51
1967	9	1967	47
1968	12	1968	48
1969	12	1969	57
1970	13	1970	59
1971	16	1971	33
1972	15	1972	63
1973	17	1973	51
1974	12	1974	54

Papers Published and Presented

Year	Number	Year	Number
1951—52	14	1963—64	35
1952—53	20	1964—65	93
1953—54	18	1965—66	99
1954—55	20	1966—67	82
1955—56	24	1967—68	80
1956—57	36	1968—69	62
1957—58	28	1969—70	53
1958—59	27	1970—71	72
1959—60	54	1971—72	111
1960—61	59	1972—73	88
1961—62	50	1973—74	83
1962—63	35	1974—75	80


INVESTIGATION REPORTS PREPARED
RESEARCH REPORTS PREPARED
NUMBER OF REPORTS
YEAR
60
50
40
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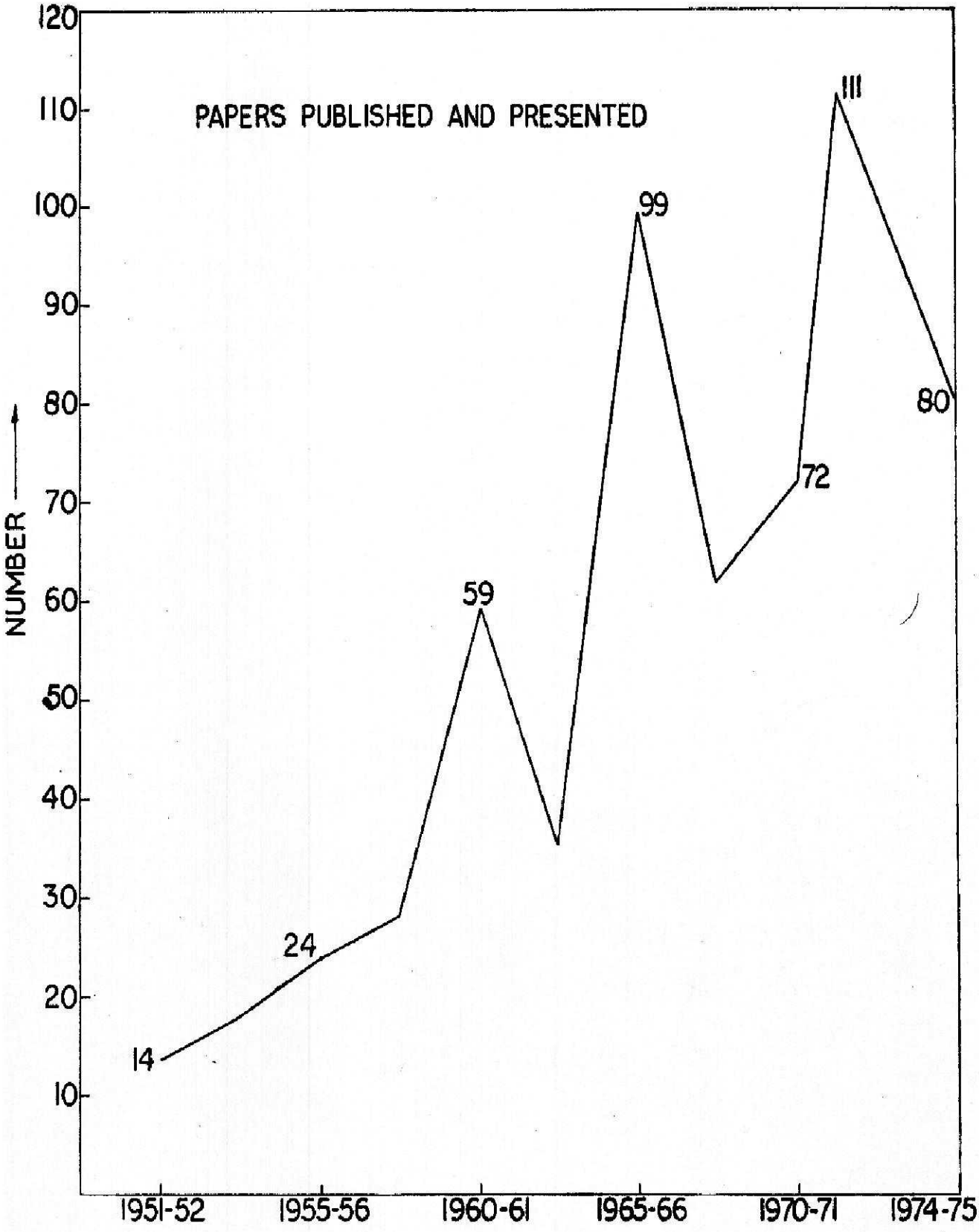

PAPERS PUBLISHED AND PRESENTED
NUMBER
120
110
100
90
80
70
60
50
40
30
20
10
14
24
59
99
72
111
80
1951-52
1955-56
1960-61
1965-66
1970-71
1974-75

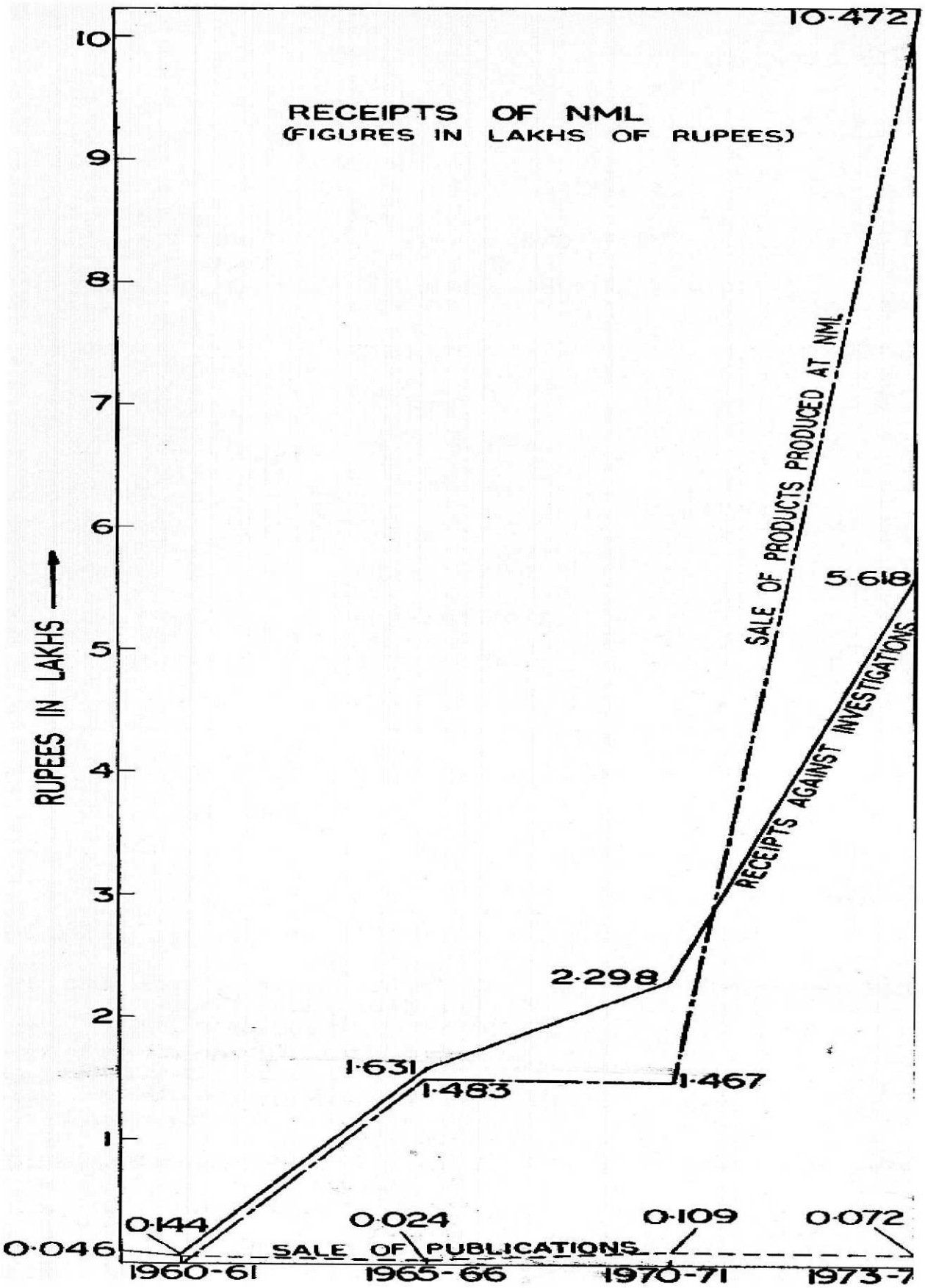
Sale Value of NML Products and Total Royalty Earned

Year	Sale Value (Rs.)	Total Royalty Earned (Rs.)
1964—65	16,300	410
1965—66	3,63,000	13,000
1966—67	8,15,000	29,000
1967—68	22,67,000	64,000
1968—69	25,29,000	70,000
1969—70	29,40,000	83,000
1970—71	74,19,000	2,97,000
1971—72	1,42,00,000	3,71,000
1972—73	1,10,91,000	2,86,000

NML Processes and Products Under Commercial Implementation

A. Processes Under Production

Process	Name of the Licencee
1. Improved carbon bonded graphite crucibles	i) M/s. Patna State Graphite & Mining Co. Ltd., Titilagarh, Orissa. ii) M/s. Mattapalli Satyam & Sons Samalkot, Andhra Pradesh (likely to commence production shortly). iii) M/s. Silcarb Crucibles (P) Ltd. Vapi Industrial Estate, Vapi Gujarat State. (Released in 1973). The plant is expected to commence production at the earliest.
2. Improved clay-bonded graphite crucibles	i) M/s. Maheshwary Graphite Udyog Pvt. Ltd., Vijayawada. ii) M/s. Patna State Graphite & Mining Co. Ltd., Titilagarh. iii) M/s. J. D. Jones & Co. (Bihar) Ltd., Jamshedpur.


RECEIPTS OF NML
(FIGURES IN LAKHS OF RUPEES)
RUPEES IN LAKHS
10
9
8
7
6
5
4
3
2
1
10·472
5·618
2·298
1·631
1·483
1·467
0·144
0·046
0·024
0·109
0·072
SALE OF PRODUCTS PRODUCED AT NML
RECEIPTS AGAINST INVESTIGATIONS
SALE OF PUBLICATIONS
1960-61
1965-66
1970-71
1973-7

Process	Name of the Licencee
3. Carbon free ferro-alloys	i) M/s. Electric Control Gear Pvt. Ltd., Ahmedabad. ii) M/s. Saindas Kishan Chand Mehra, Amritsar iii) M/s. R. Sen & Co. Calcutta iv) M/s. T. K. Industries, Kuruskhestra v) M/s. Industrial Minerals & Chemical Co. Ltd., Bombay vi) M/s. Stemet Alloys Ltd., New Delhi vii) M/s. Bharat Pulvenishing Mills Ltd., Bombay (v and vi to commence production)
4. Hot-dip aluminising of ferrous materials	i) M/s. Sri Venkata Durga Aluminising Works Ltd., Nandigama, AP (Aluminised wires) ii) M/s. Bharat Aluminising Works, Ahmedabad (Likely to commence production shortly).
5. Fluxes for submerged arc welding	M/s. Tapadia Engineers & Traders Ltd., Raipur
6. Bright nickel plating salt	M/s. Dunlop India Ltd., Calcutta
7. Electrical resistance alloys for heating elements	M/s. Cable Works (I) Ltd., Calcutta
8. Metal powders by atomization (i) of molten metals (Al & Zinc-60 to+200 mesh size)	i) M/s. Industrial Minerals & Chemicals Co. Bombay (to commence production). ii) M/s. Sinterfine Metal Powders, Delhi
9. Electric grade aluminium alloy	i) M/s. Aluminium Cables & Conductor Ltd., Calcutta ii) M/s. Bharati Smelting & Refining Corporation, Worli, Bombay, to commence production shortly iii) M/s. Galada Continuous Castings Ltd., Uppal, Hyderabad
10. Production of sponge iron with solid reductant	M/s. Andhra Cement Co., Vijaywada
11. Production of ferro-vanadium	M/s Mysore Iron & Steel Works, Bhadravati
B. Processes Released and Production to Commence	
1. Thermostatic bi-metals	M/s. Cable Works (I) Ltd., Calcutta
2. Ceramic magnets	M/s. Tapadia Engineers & Traders Pvt. Ltd., Raipur
3. Electrolytic manganese dioxide	M/s. T. K. Chemicals, Bombay
4. Production of extra fine zinc dust	M/s. Associated Pigments Ltd., Calcutta (under installation)
5. Basic lined side blown converter	i) M/s. Mehra Ferro Alloys Ltd., Amritsar ii) M/s. Kartar Iron & Steel Co., Ltd., Jamshedpur iii) M/s. Pratap Steels Ltd., Mahindra Garh, Amritsar (awaiting Govt. of India's clearance)
6. Bi-metallic powders by atomization	M/s. Paras Metal Powders, Nasik
7. Extra-fine non-ferrous metal powders by atomisation	M/s. NALCO Metal Products Ltd., Madurai.

Priced Publications

NML Technical Journal—a Quarterly Publication

Proceedings of Symposia and Seminars on

Electroplating and Metal Finishing

Industrial Failure of Engineering Metals and Alloys

Non-ferrous Metal Industry in India

Recent Trends in the Field of Production, Practice and Research Refractories used in Metal Industries

Production, Properties and Application of Alloy and Special Steel

Mineral Beneficiation and Extractive Metallurgical Techniques

Recent Developments in Foundry Technology

Iron and Steel Industry in India

Pilot Plants in Metallurgical Research and Development

Ferro Alloy Industry in India

Light Metal Industry in India

Utilization of Metallurgical Wastes

Micro Metallurgy—the role of minute additions to ferrous and non-ferrous metals and alloys

Metallurgy of Substitute Ferrous and Non-ferrous Alloys

Non-Ferrous Metals Technology (Vols. 1, 2 & 3)

Science and Technology of Sponge Iron and its Conversion to Steel

Bacterial Leaching

* * * * *

Monographs on

Low Grade Manganese Ores of India

Austenitic Grain Size Control of Steel

Foundry Moulding Sands

Indian Foundry Bentonite Clays

Structure of Electro-deposited Manganese

Atlas on Ttansformation Diagrams of Low Alloy Steels

* * * * *

Documented Survey on Metallurgical Developments—A monthly publication

Patents

Serial No.	Title	Patent No.
1.	A process for the hot-dip aluminising of ferrous materials	55289
2.	Aluminising of iron and steel	57938
3.	Refractory compositions comprising graphite and silicon carbide . .	58869
4.	New stainless steels and methods of preparing them	61978 61979 61980
5.	Improvements in or relating to hot-dip aluminising of steel	65231
6.	Refractory compositions comprising graphite and aluminosilicate materials and glazes to render such compositions resistant to oxidation	62352
7.	An improved method for the production of chromium-manganese alloys by aluminothermic reaction	65231
8.	Compositions and methods of making welding flux	68171
9.	Improvements in or relating to the production of copper powder by electrolytic process	76997
10.	Improvements in or relating to electro-deposition of metals particularly manganese by direct current electrolysis of aqueous solution containing metal ions. .	81402
11.	Improvements in or relating to magnesite refractories	83652
12.	Improvements in or relating to electrolytic cells	84670
13.	Improvement in or relating to a precision temperature controller for use with electrical resistance furnaces up to 1600°C	91134
14.	An improved device for the isolation of dross in molten metallic baths during continuous hot-dip processing of strip or wire	94768
15.	An improved device for the continuous hot-dip coating of metallic strip and wire	94769
16.	A method for recovery of metallic values from their waste metallic fines particularly zinc and aluminium fines.	102483
17.	A pneumatic process for the conversion of phosphoric pig irons to steels . .	105895
18.	Stable castable suspensions of non-plastic aluminosilicate materials and method of making the same	107982
19.	Chemically bonded forsterite refractories and methods of their production . .	108583
20.	Improvements in or relating to the production of fluoboric acid	110834
21.	Improvements in or relating to welding flux compositions and methods for making the same	114500
22.	An improved and modified process for the manufacture of ferrite magnets . .	116520
23.	A process for stabilisation of ferro-silicon	118916
24.	A process for production of electro deposited manganese dioxide containing iron	118982

Serial No.	Title	Patent No.
25.	Development in or relating to the production of aluminium alloy anodes for cathodic protection	119950
26.	Manufacture of pig iron and similar products and stack furnace therefor . .	125548
27.	An improved method for the removal of vanadium from vanadium pig iron . .	126062
28.	Improvements in or relating to preparation of powdered iron	12907
29.	A simple heat exchanger for pre-heating the air in cupola	131823
30.	A process for selective reduction of iron oxide in complex ores . .	131607
31.	A process for production of sponge iron	131637
32.	An improved method relating to the extraction of nickel and cobalt values from oxidised (lateritic) ores.	131685
33.	Fe-Ti alloys—new high hardness materials	133700
34.	Improvements in or relating to the preparation of pellets containing carbonate ores and carbonaceous materials	134377
35.	Improvements in or relating to prevention of tranishing of copper and copper base alloys	135030
36.	Improvements in or relating to plating on steels with a fine layer of metallic chromium and chromium oxide	135213
37.	An improved method for the extraction of metals from solution by solid state absorption	1719/72
38.	A process to coat steel surfaces with vinyl compositions and the products thus coated	2168/72
39.	A process and equipme t for producing sponge iron	670/Cal/73
40.	Improvements in or relating to non-sludge forming zinc phosphating composition	2247/Cal/73
41.	Improvements in or relating to the manufacturing process of versatile aluminium alloy/aluminium conductor for multifarious electrical applications . .	Cal/2042/73
42.	Improvements in or relating to removal of phosphorus and iron from fluorspar . .	2614/Cal/73
43.	A device for the position control of the electrodes of electric furnace . .	
44.	Improvements in or relating to production of soluble granules used in making cellular metal	1549/Cal/74
45.	Improvements in or relating to recovery of selenium from copper refinery slimes	2109/Cal/74
46.	A process to coat aluminium surfaces with vinyl compositions and the products thus coated	
47.	Extraction of nickel and cobalt values from lateritic and limonitic nickeliferous ores by coal reduction and ammonical leaching in presence of a catalyst. —.	284/Cal/74 113/Cal/74
48.	Improvements in or relating to recovery of tellurium from copper refining slimes.	Filed

Social Activities

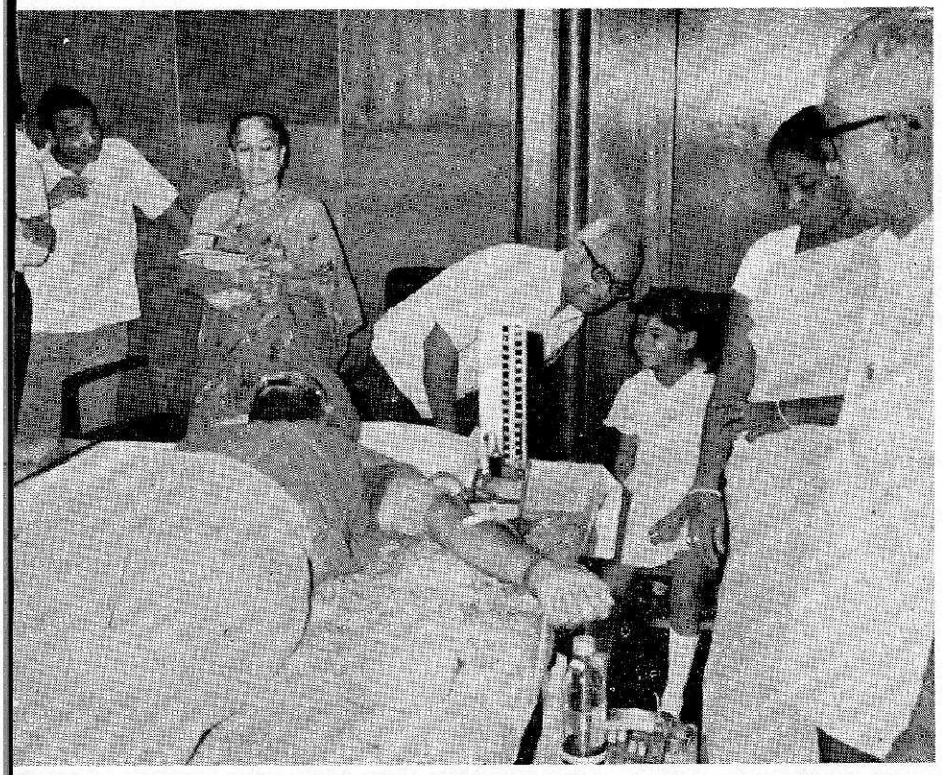
The National Metallurgical Laboratory encourages the social activities for the staff. A well organised NML Club has been formed since 1953. The club conducts various outdoor and indoor games like cricket, football, badminton, volleyball, table tennis, chess, cards etc. and competitive tournaments are organised. The club also participates in various local tournaments. The NML Cricket Club is a recognised team under Bihar Cricket Association and plays in the cricket league. The Laboratory teams also participate in Shanti Swroop Bhatnagar Memorial Tournament organised by CSIR and has won winners and runners-up trophies in tennis, table tennis and volley ball. Annual sports and picnics are held in which the staff and their family members join. Cinema shows are held regularly for the NML staff and their families.

Two Kindergarten Schools for the NML colony children at Agrico and Tuiladungari colonies have been established. The Welfare Committees of these two colonies look after the security and cleanliness of the colonies and organises cultural shows, sports etc. Arts and music classes are held for the boys, girls and ladies of the colony.

NML staff Cooperative Credit Society is operating for more than a decade and is handling transactions worth nearly rupees two lakhs annually. The Staff Co-operative Stores is supplying rations, foodstaff, stationery articles to the staff members at controlled rate. A canteen is run by the NML staff and it provides lunch, snacks, tea, coffee etc. at reasonable prices.

For facilitating the banking and postal work of the Laboratory and its staff, the Laboratory has provided accommodation within its premises for functioning of a branch of State Bank of India and a post office.

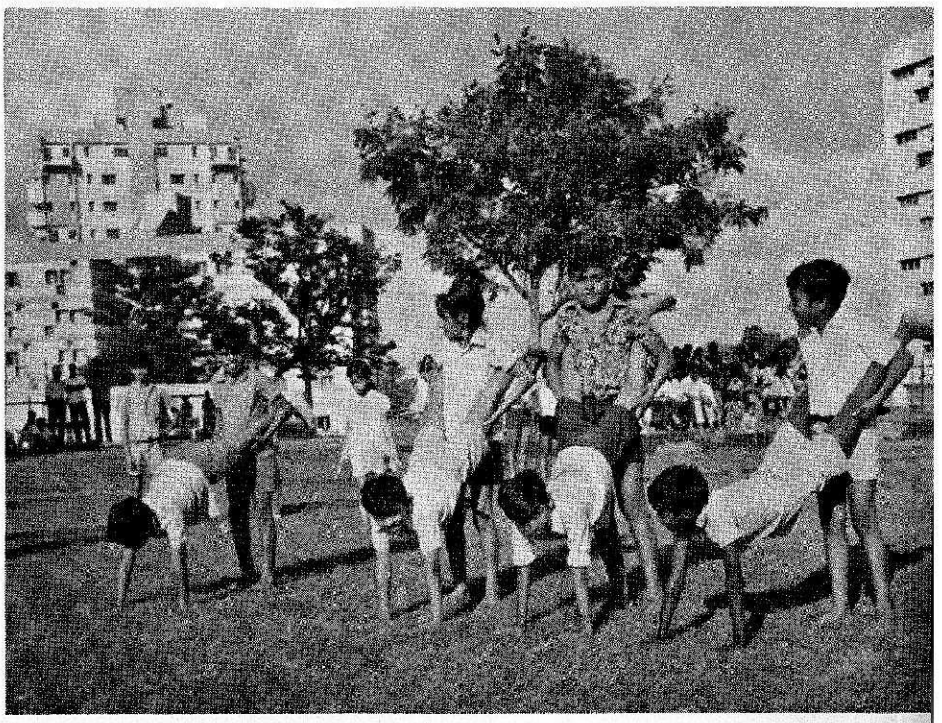
Prof. V. A. Altekar, Director, and Mrs. Altekar along with the students of Arts and Crafts class of NML Colony



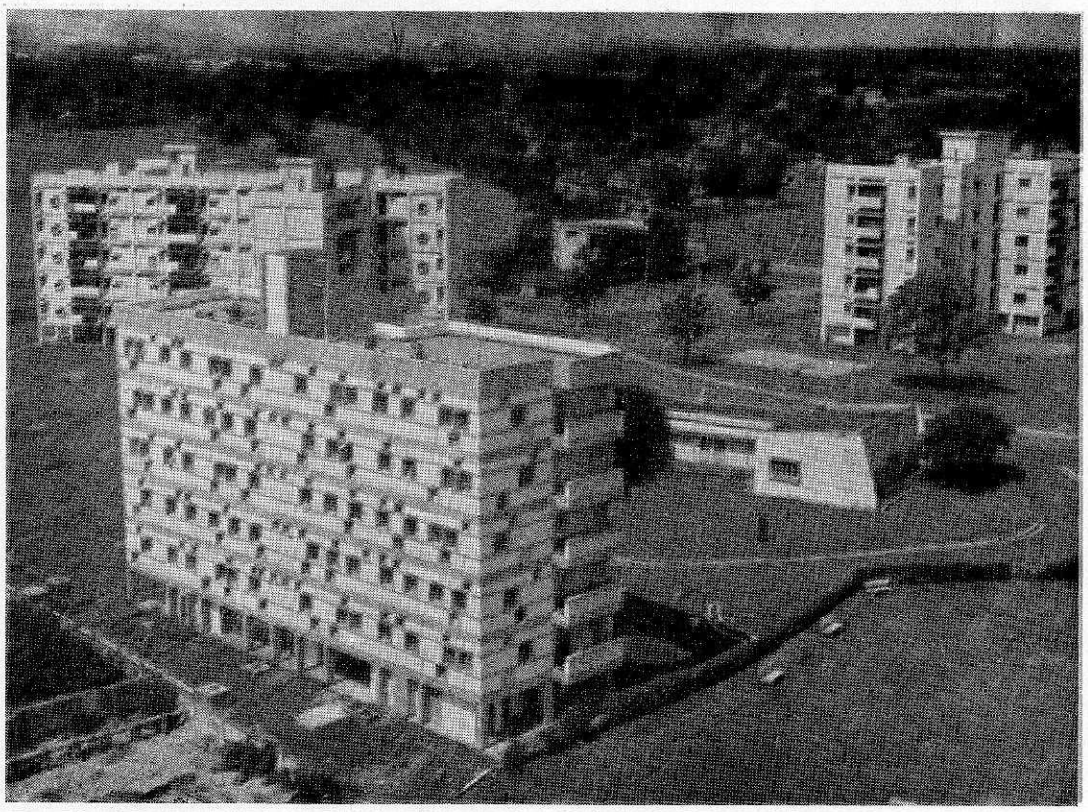
NML Staff Members donating blood for Blood Bank

Kindergarten School at NML Colony

Mrs. V. A. Altekar donating clothes collected by ladies of NML Staff colonies for the Bihar Flood relief



NML Staff Children in a Sports event



A view of the NML Residential Flats at Agrico Colony

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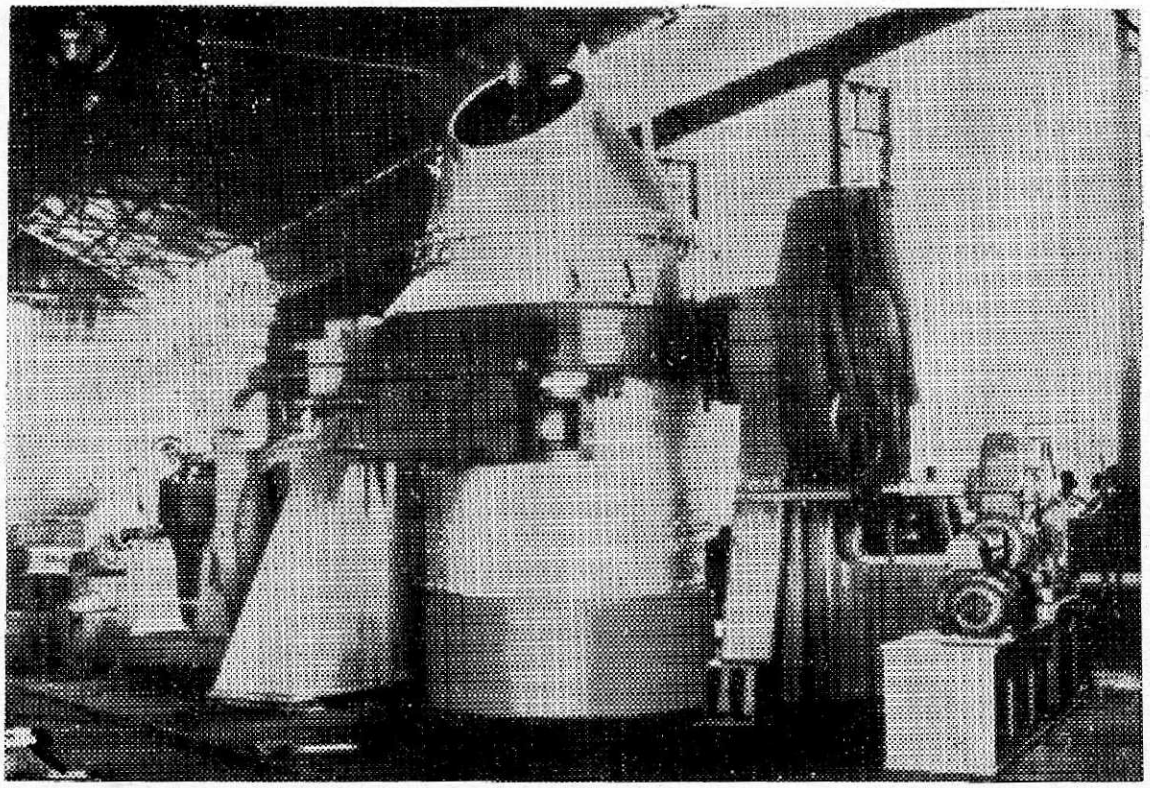

THE PHOTOGRAPH SHOWS A 2 M/T SIDE BLOWN CONVERTER MANUFACTURED BY DAVY ASHMORE INDIA LIMITED.

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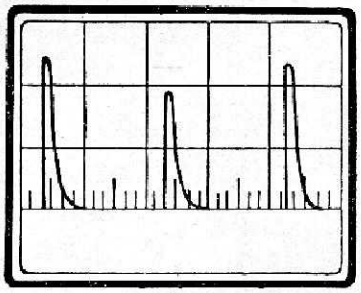

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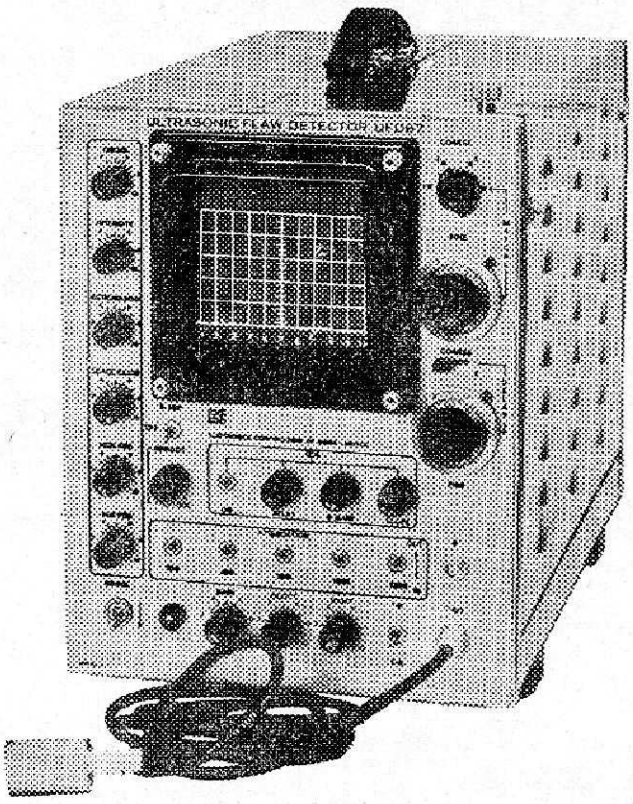

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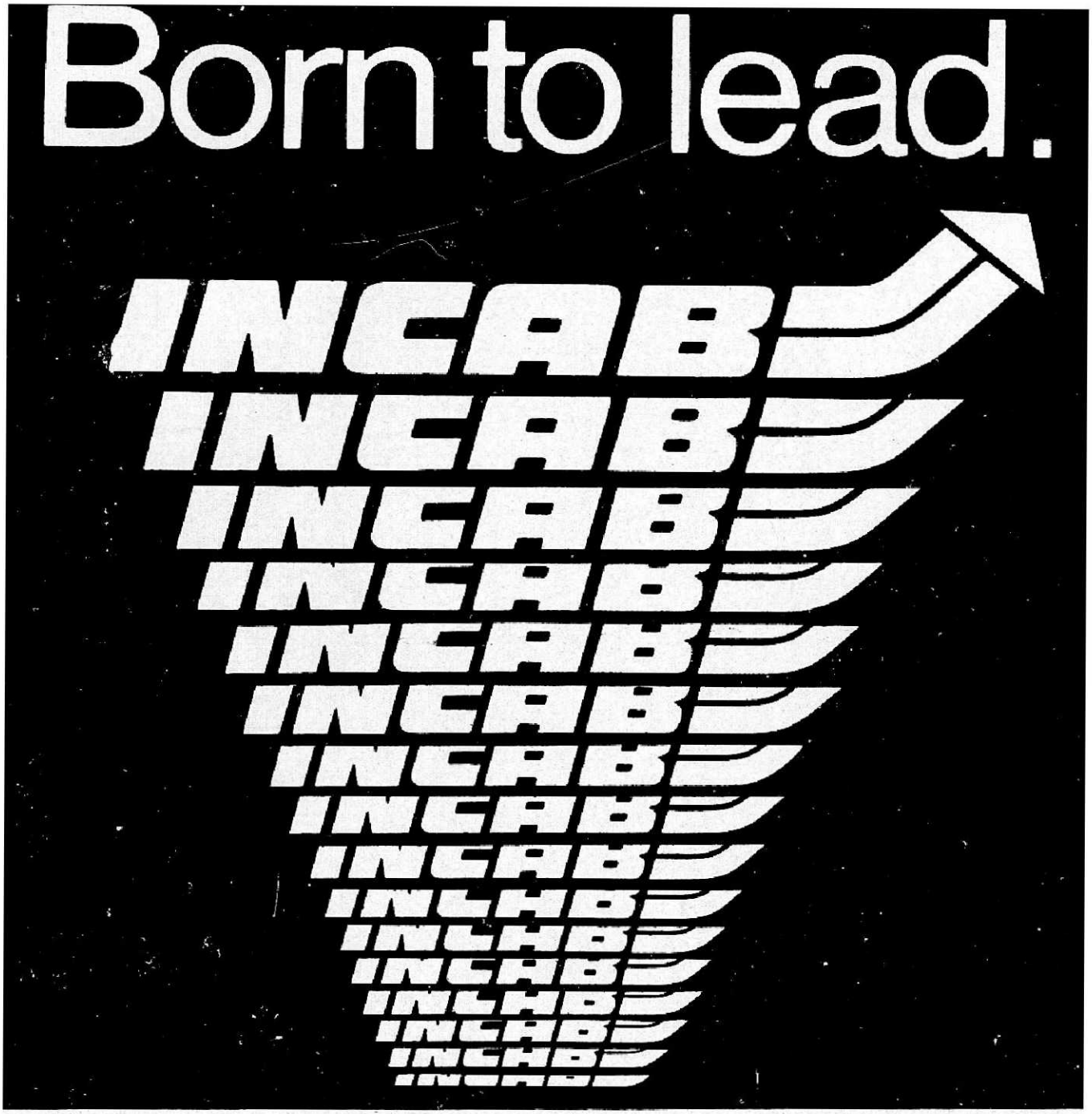

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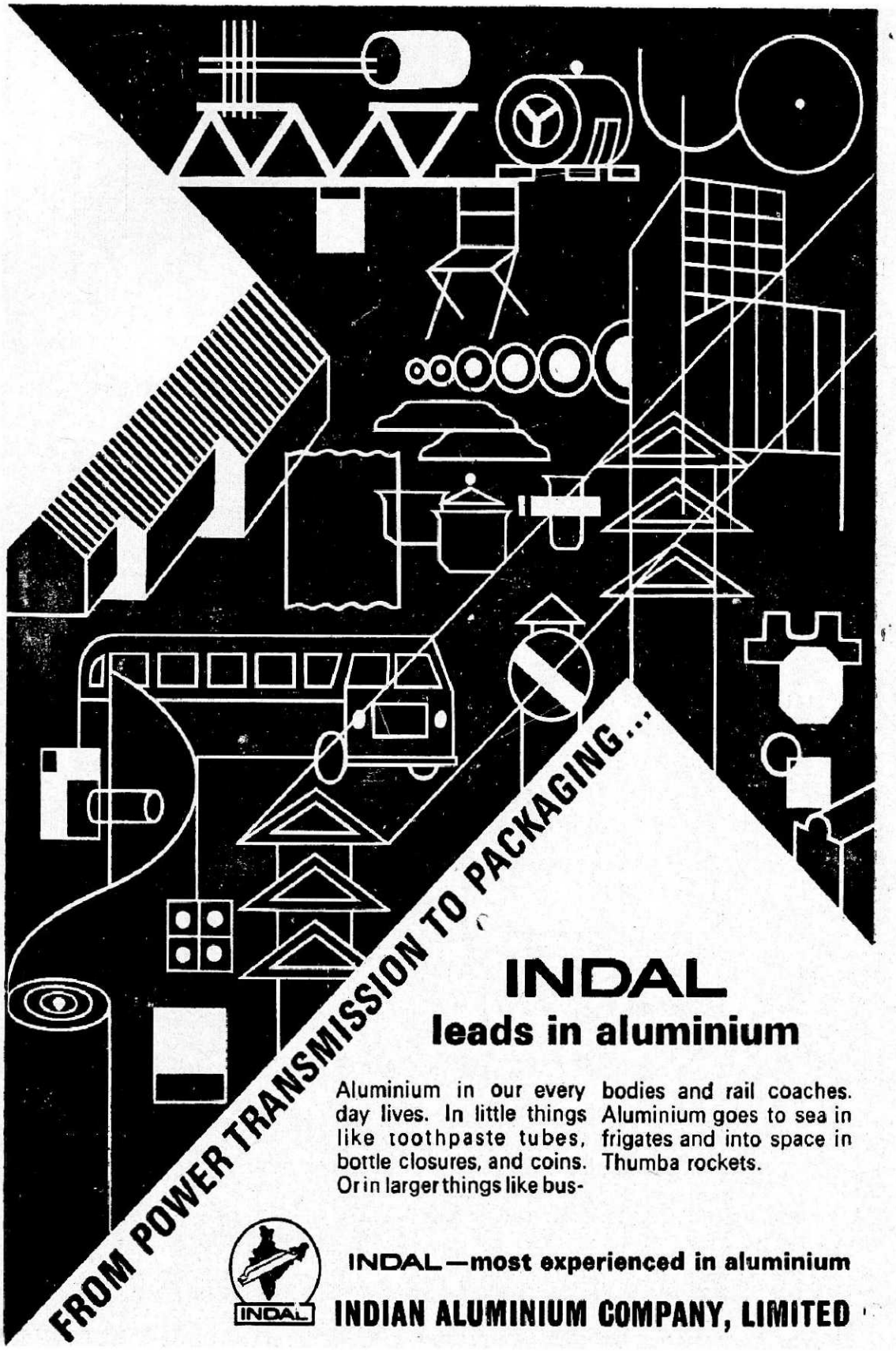

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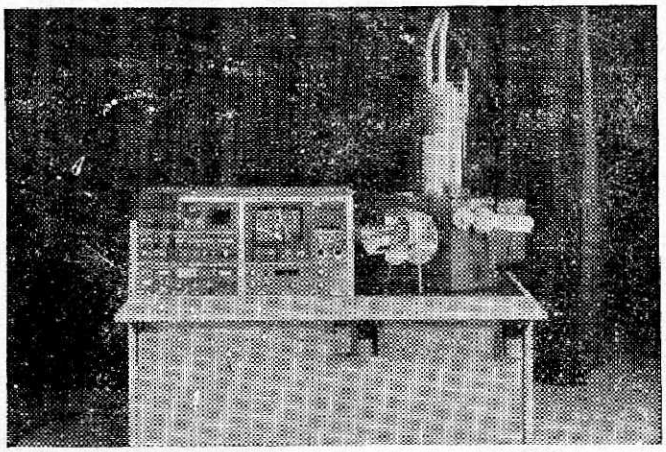

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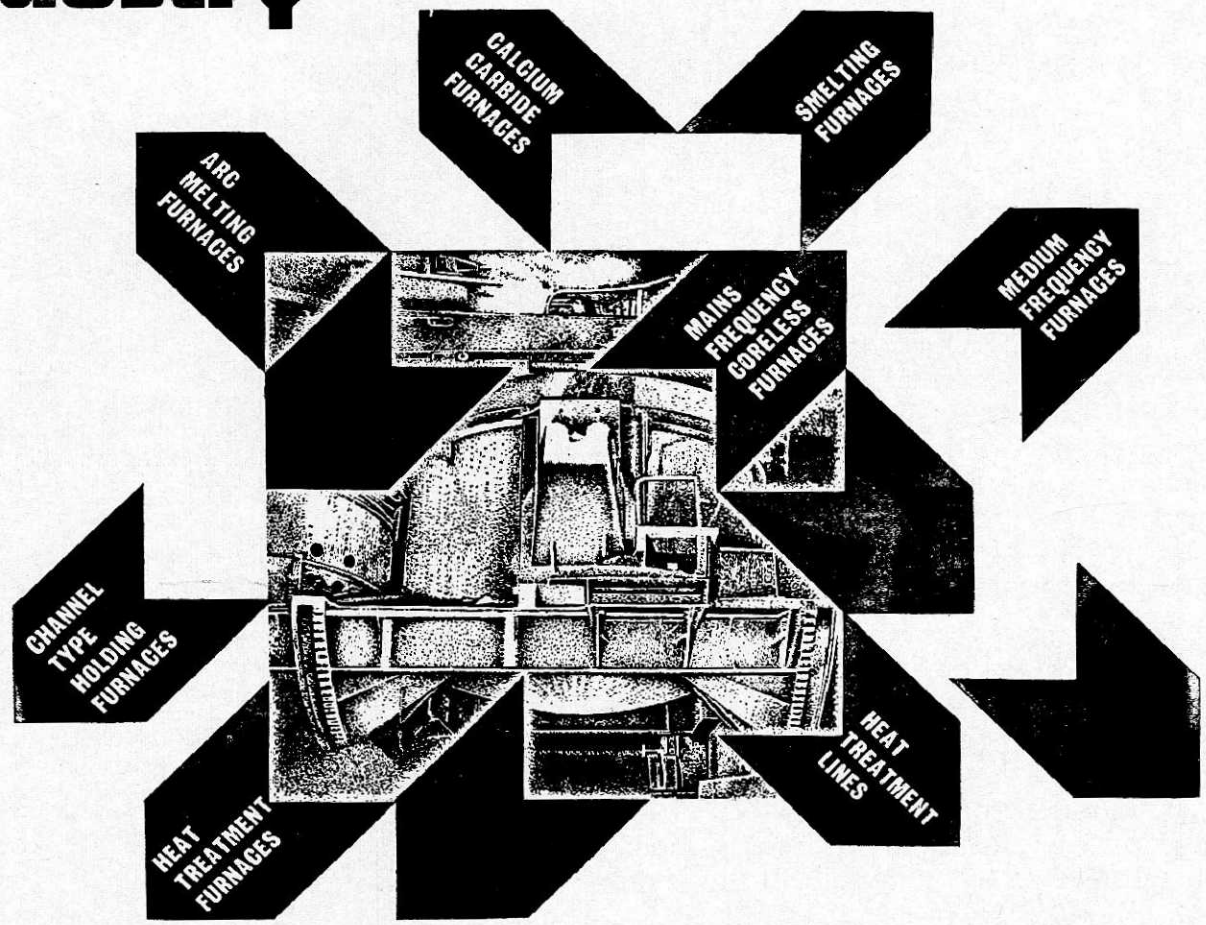

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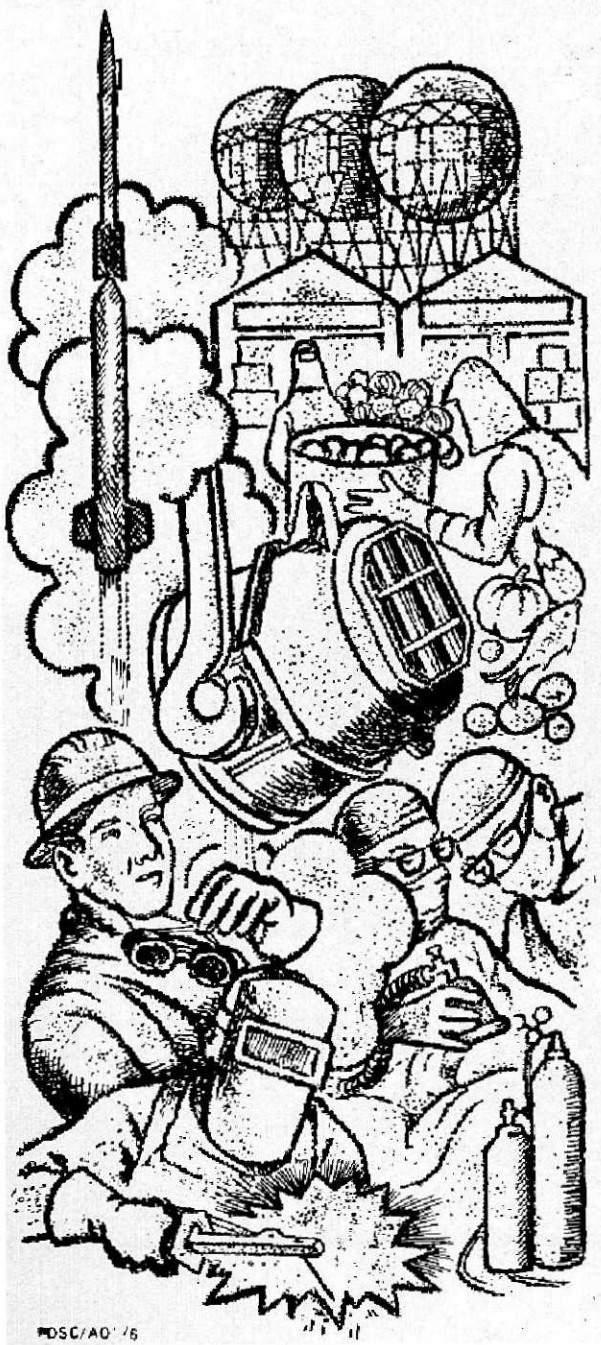

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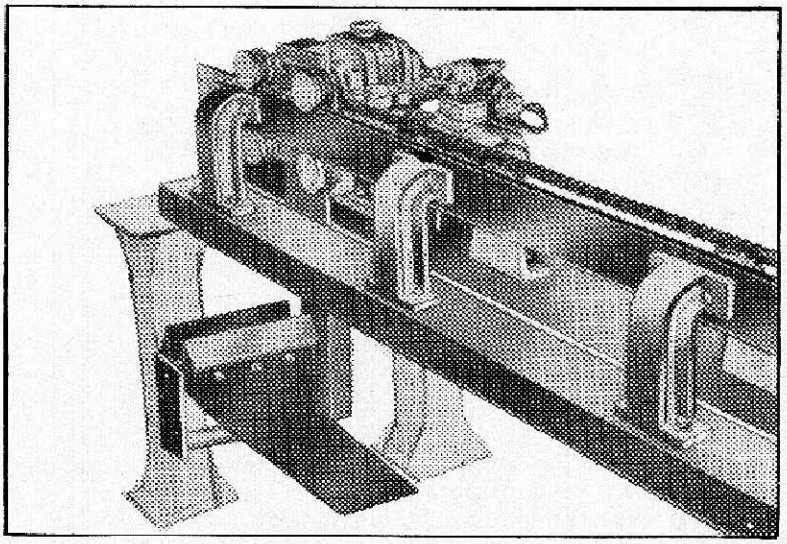

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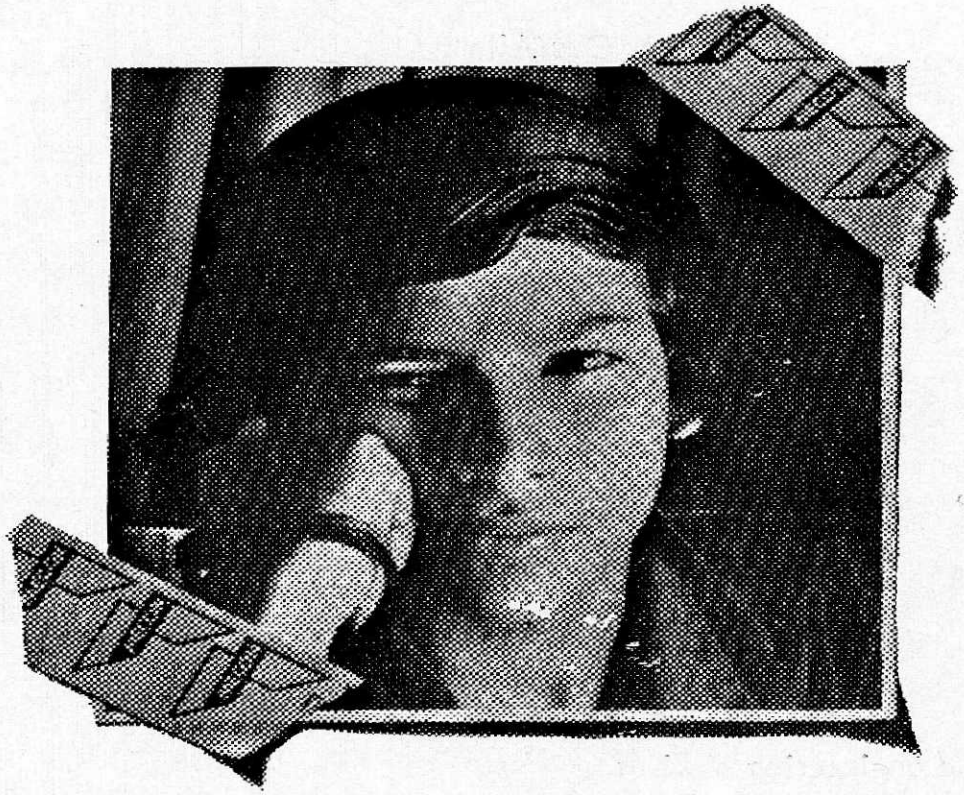

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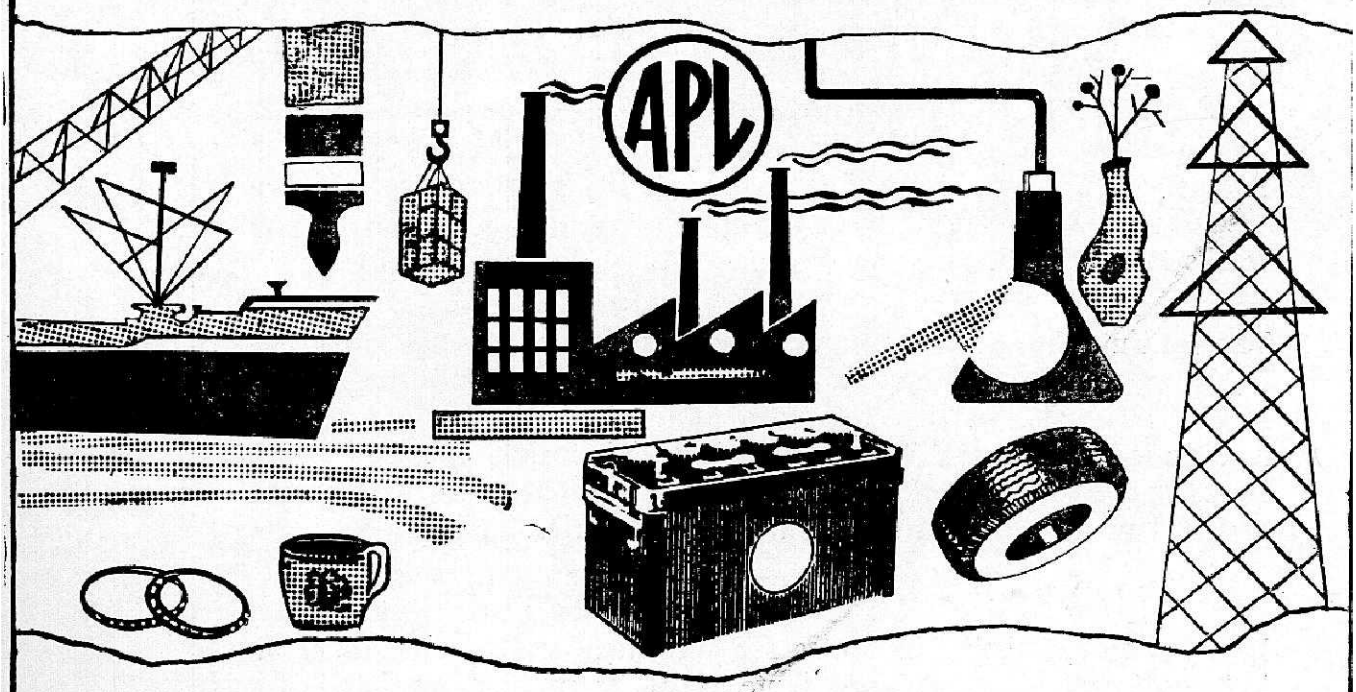

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(i) To provide training through short term courses of 2 to 12 weeks duration, long term Advanced Diploma Courses of 18 months duration and Post Graduate Diploma of 24 months duration and also tailor made courses (depending upon the requirement of the industries/institutions.)

(ii) to guide and conduct applied industrial research in collaboration with industries/institutions in the country and provide nation wide Documentation & Information Services in Foundry, Forge and allied fields.

(iii) to cooperate with Educational and other institutions in any part of the world having similar aims and objectives.

In the field of R & D, the institute has undertaken research projects with both public and private sectors such as HSL, HEC, Bokaro Steel Ltd., Bihar Alloys, Patratu etc. NIFFT is also rendering assistance to industries small, medium scale by offering consultancy services and at present 15 consultancy works are in hand.

The institute has so far conducted 42 short term courses and 5 Advanced Diploma courses (18 months duration) in Foundry and Forge Technology. NIFFT has also carried out Post Graduate work in industrial problems leading to Masters and PhD Degree in collaboration with BIT Mesra. Nine Industrial Research projects have been allocated to NIFFT which will be undertaken in collaboration with other industries.

NIFFT is conducting Post Graduate course by research and 12 industries have sponsored their candidates for carrying out Research on their specific industrial problems and the institute has in its credit more than 100 technical papers published in various Indian and foreign journals.

NIFFT is administered through a Board of Governors representing Industry, professional bodies and the Govt. with Shri Ranchor Prasad as Chairman and Dr. S. S. Khanna, Director of the Institute, as Member Secretary.

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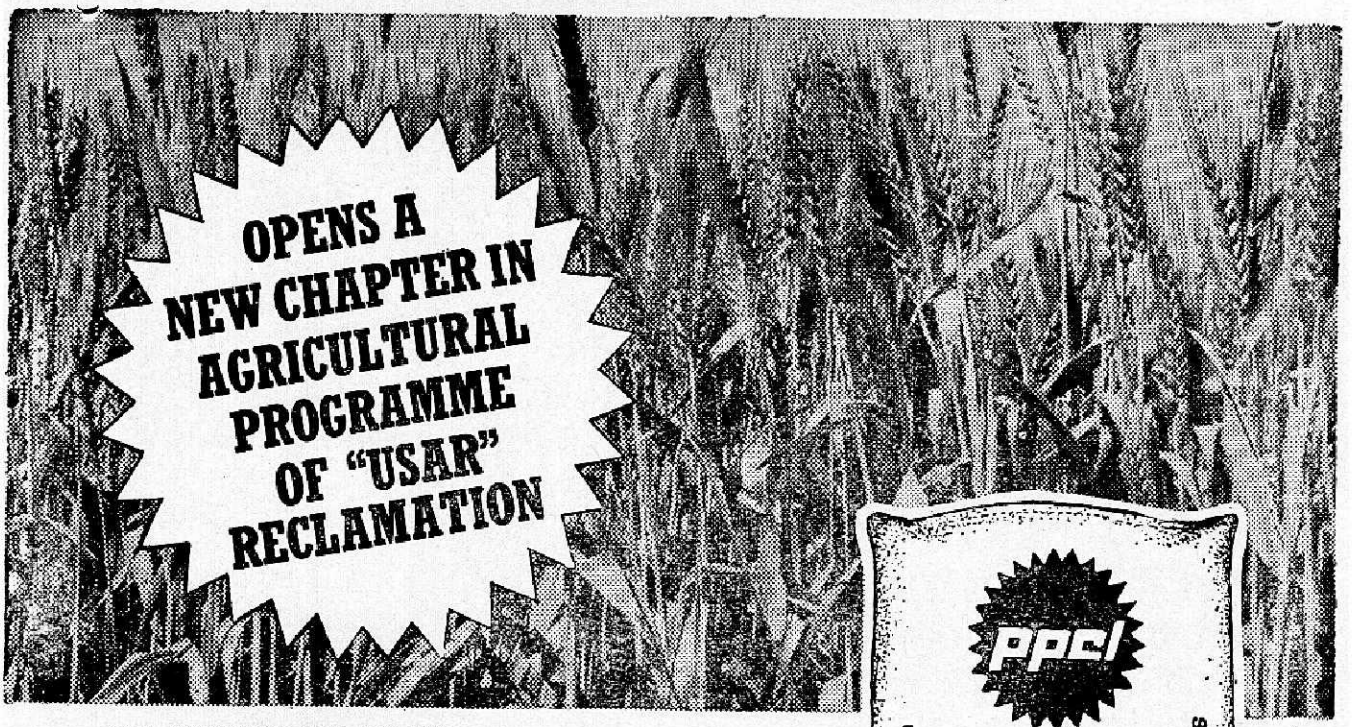

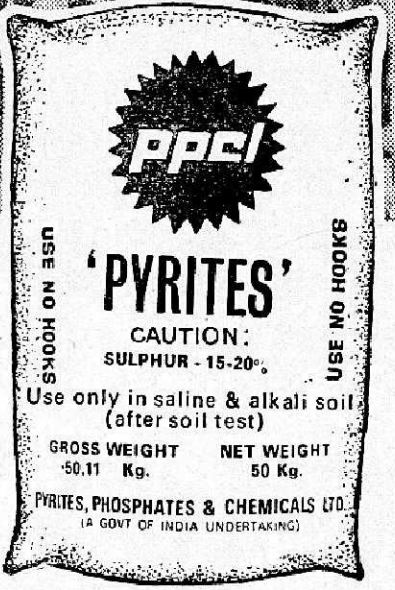

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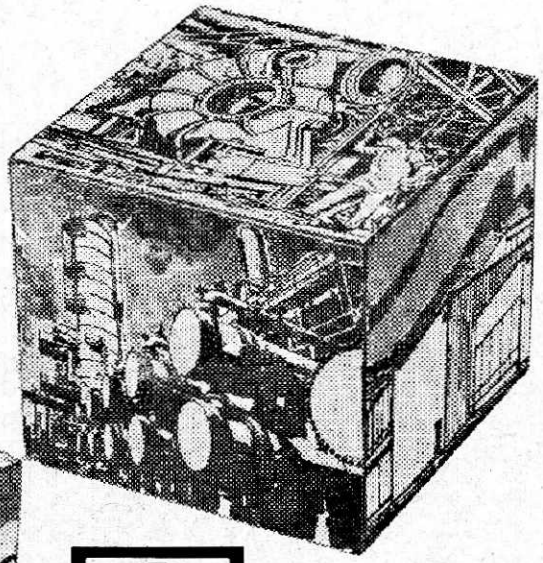

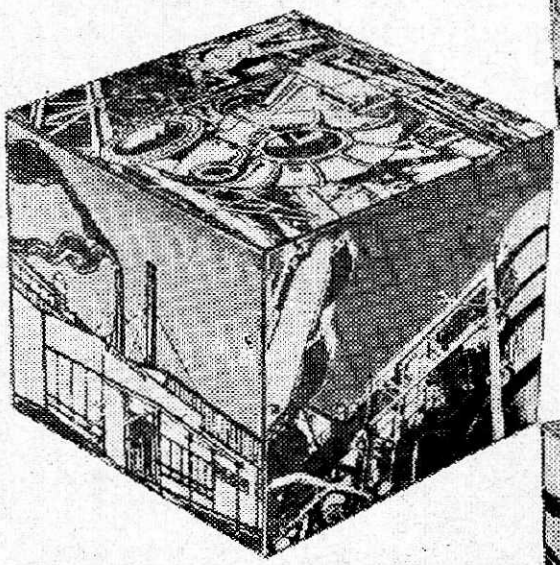

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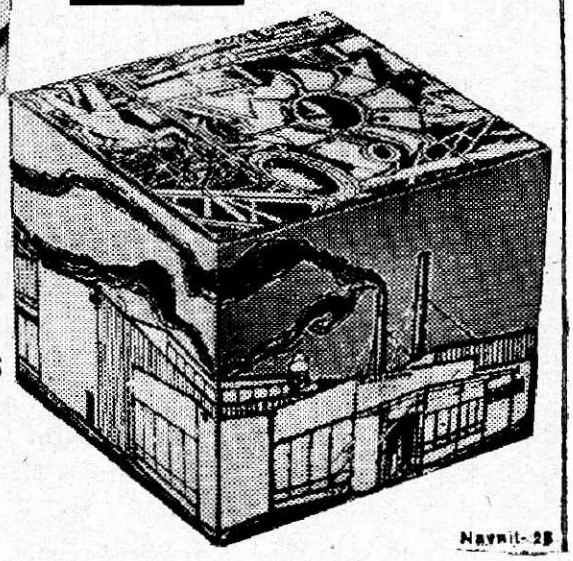

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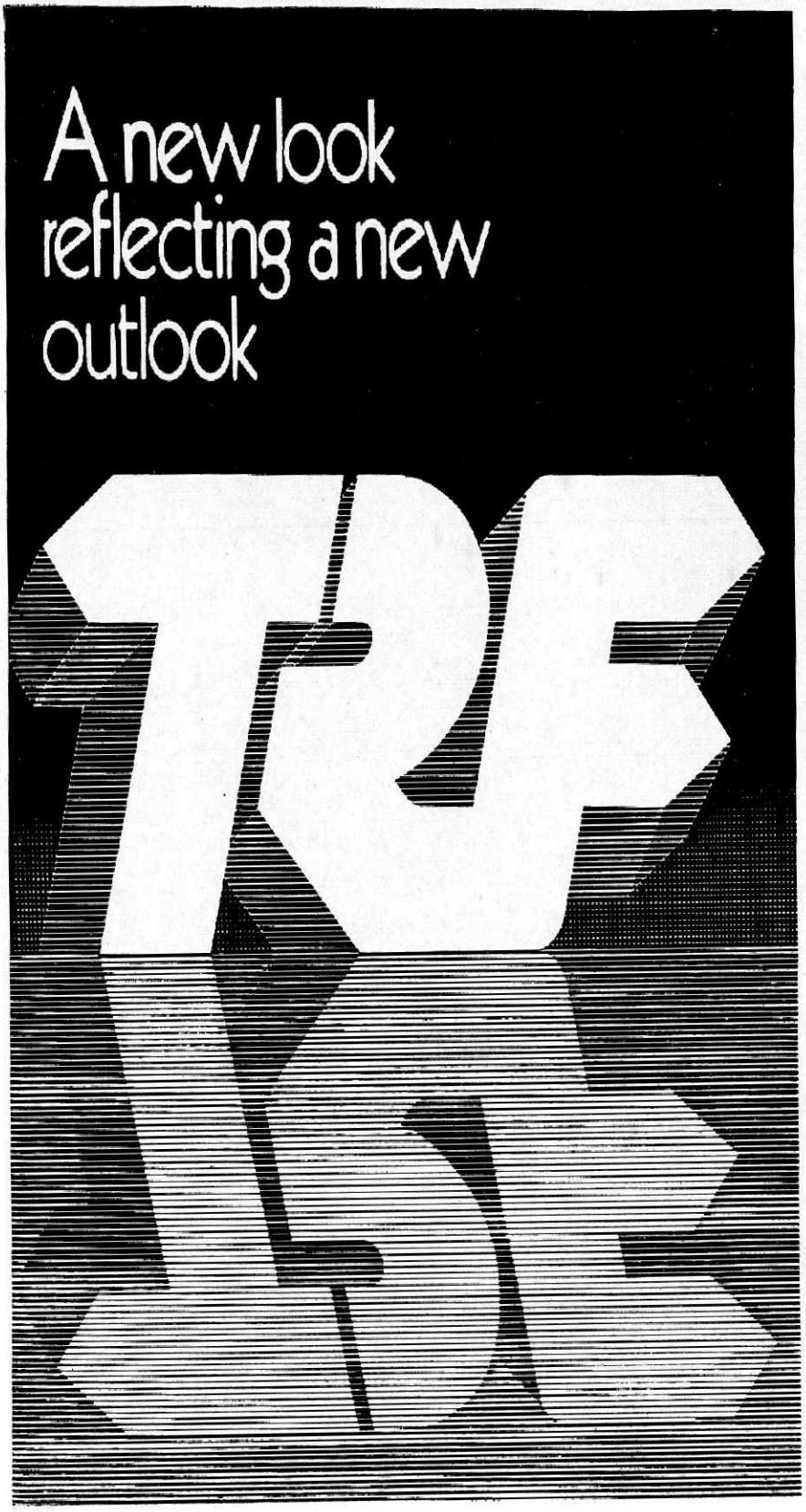

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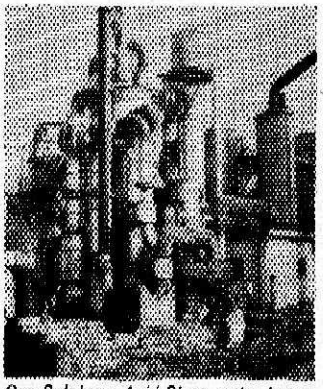
(Figures in metric tonnes)

March '75	April '74 to March '75	April '73 to March '74	April '72 to March '73
3248	15801	12899	12596

A view of the Smelter at the Khetri Copper Complex inaugurated on 5th February 1975 by the Prime Minister, Smt. Indira Gandhi.

Copper is vital to economic growth. With the increase in production achieved by HCL, we are attempting to increase the country's self-reliance in this vital sector and to maximise saving of foreign exchange. Simultaneously we are building up indigenous expertise and technology.



Our Sulphuric Acid Plant at the Indian Copper Complex, Ghatsila inaugurated on 17th January 1975 by the Union Minister of State for Steel & Mines, Shri Chandrajit Yadav.

We are striving hard to raise copper production at our existing units and to exploit the other proven reserves. Our Flash Smelter at the Khetri Copper Complex in Rajasthan was inaugurated by the Prime Minister, Smt. Indira Gandhi. We are also setting up an acid-cum-fertilizer plant at KCC. At our Indian Copper Complex in Ghatsila, Bihar, besides increasing production of copper, we recently started producing SELENIUM, for the first time in the country. We are also marketing Sulphuric Acid produced at this Complex. At Dariba, Rajasthan, we mill ore to be fed into the Khetri Smelter. At Agnigundala in Andhra Pradesh, we have established capacity to produce Lead concentrates.

We hope to complete a 500 tonnes/day ore producing unit in Chandmari near KCC ahead of schedule and also plan to start work soon to exploit the rich open cast reserves at Malanjkhand in Madhya Pradesh.

We are looking ahead, because that's where we in the public sector are going. We are confident that every step forward helps industrial growth and therefore makes the nation economically stronger and more self reliant.

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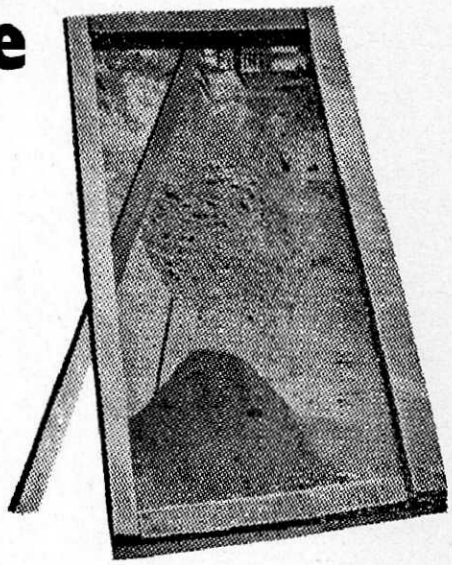

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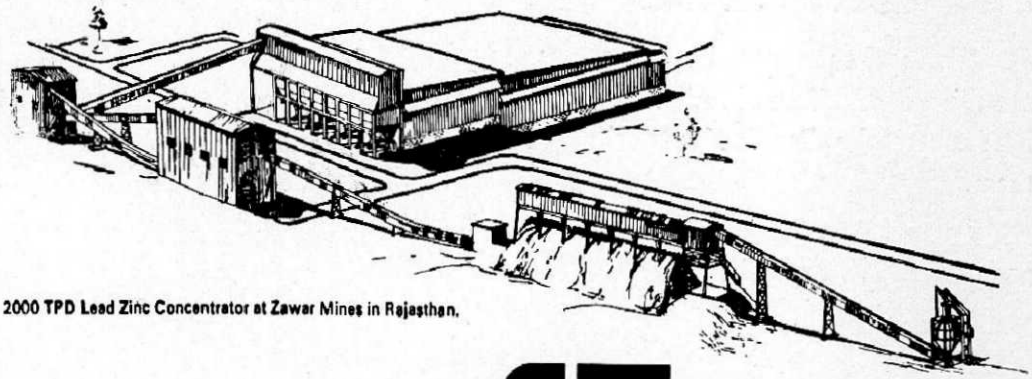
The successful operation of these MBE-built plants marks a giant step towards self-sufficiency in technology in a most vital sector of the economy.

MBE will soon start the construction of another 2000 TPD Concentrator at the Balaria Mines of Hindustan Zinc Limited as part of their expansion programme.



2000 TPD Lead Zinc Concentrator at Zawar Mines in Rajasthan.

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